

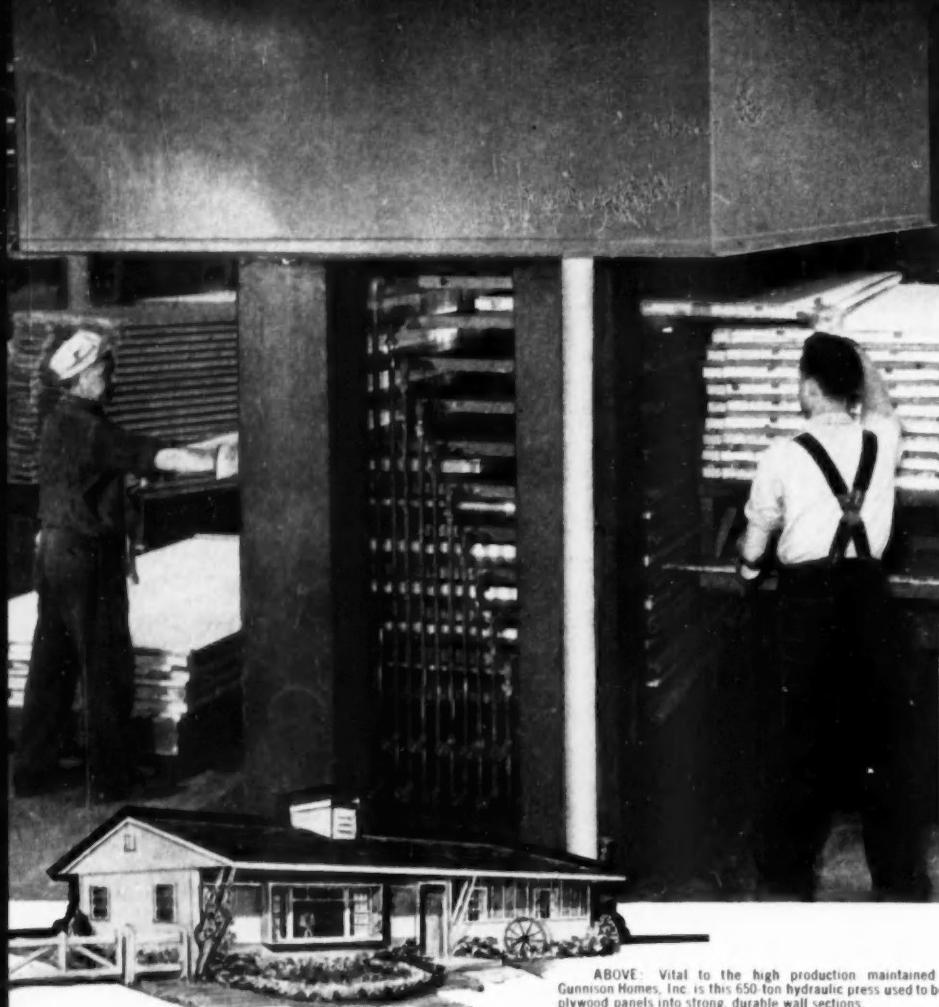
# AUTOMOTIVE INDUSTRIES

JULY 1, 1953

AUTOMOTIVE and AVIATION MANUFACTURING  
CIVILIAN AND DEFENSE  
ENGINEERING • PRODUCTION • MANAGEMENT

***In This Issue . . .*** New Powerglide Tooling . . . . . Cars on Credit . . . . .  
SAE Engineering Highlights . . . . . United Nations  
Vehicle Study . . . . . B-47 Landing Gear Strut . . . . .  
COMPLETE TABLE OF Japanese Automobile Industry . . . . . City-Bus Fuels  
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A CHILTON PUBLICATION



ABOVE: Vital to the high production maintained by Gunnison Homes, Inc. is this 650-ton hydraulic press used to bond plywood panels into strong, durable wall sections.

LEFT: Handsome, precision built homes, like the Gunnison Coronado pictured here, are built in a matter of hours.

## Answers a pressing need for Gunnison Homes, Inc. . . .

• Gunnison Homes, Inc., situated in New Albany, Indiana, is one of the leaders in the field of manufactured homes. Key to continuous production of precision built homes at the New Albany plant is the 650-ton hydraulic press, shown above, which was installed in 1947. This press processes ten plywood panels every cycle . . . a tough job and one requiring reliable hydraulic performance to maintain production schedules.

STANOIL Industrial Oil was installed in the press when it was put into operation six years ago. STANOIL has stood the test of severe operation . . . with no evidence of oil deterioration being found during a recent inspection of the hydraulic system. Operation has been efficient. Minimum make-up oil has been needed to

maintain the oil capacity of 450 gallons.

Find how STANOIL can benefit you by discussing this multi-purpose oil with a Standard lubrication specialist. You can contact him by phoning your local Standard Oil office. Or, write: Standard Oil Company, 910 S. Michigan Ave., Chicago 80, Ill.

**STANDARD OIL COMPANY**

# What's YOUR problem?



Ralph E. Murnahan, of Standard Oil's Evansville office, is the lubrication specialist who keeps in constant contact with Gunnison Homes to make certain that there is no interruption of operation due to lubrication difficulties.

He is one of many lubrication specialists who make their headquarters in Standard's offices throughout the Midwest. These men have been specially trained in Standard's Lubrication Engineering Schools and, in addition, have a wealth of on-the-job experience.

To obtain the service of the lubrication specialist in your area, you need only call your local Standard Oil office. The lubrication specialist will discuss your lubrication problems with you . . . at no obligation to you, of course. He has a complete line of petroleum products to offer you, including:

**SUPERLA Greases**—Available in a wide range of consistency grades and in both lime-soap and soda-soap types. SUPERLA Greases cover a wide range of operations. These efficient products are comparable in quality with the highest type of special greases.

**STANOLITH Greases**—Because these unique lithium soap products possess the heat resistant properties of soda-soap greases and the water resistant properties of lime-soap greases, they offer a solution to lubrication problems caused by the presence of both heat and water.



(Indiana)

**On big equipment...  
to balance high engine speeds —**



Snow Master manufactured  
by Sicard Industries, Inc.  
Watertown, New York

**COTTA REDUCTION UNITS  
save maintenance costs!**

Reducing high auxiliary engine speeds to those best suited for snow plows is a typical Cotta job. Why? First . . . because Cotta heavy-duty Reduction Units are low in cost, ordered in large or small quantity lots. Second . . . maintenance is low, too, because they're built to withstand heavy, intermittent shock loads . . . give dependable performance on grueling, 'round-the-clock work schedules — indoors or out. And third . . .

because Cotta Reduction Units are precision-engineered and skillfully assembled by *specialists* with long experience and *know-how* in heavy-duty power transmission work.

If you build cranes, locomotives, drillers, shovels, generators, pumps or other heavy-duty equipment, and you want a standard or "engineered-to-order" Reduction Unit — input torque ranging from 150 to 2000 foot pounds — see Cotta first!

THIS INFORMATION WILL HELP YOU

Sent free on request — diagrams, capacity tables, dimensions, and complete specifications. State your problem — COTTA engineers will help you select the right unit for best performance. Write today.

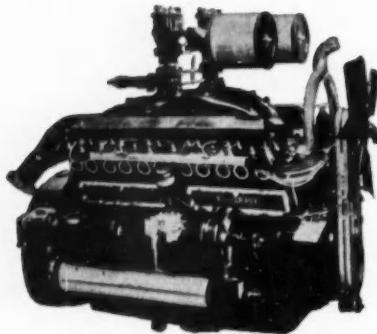
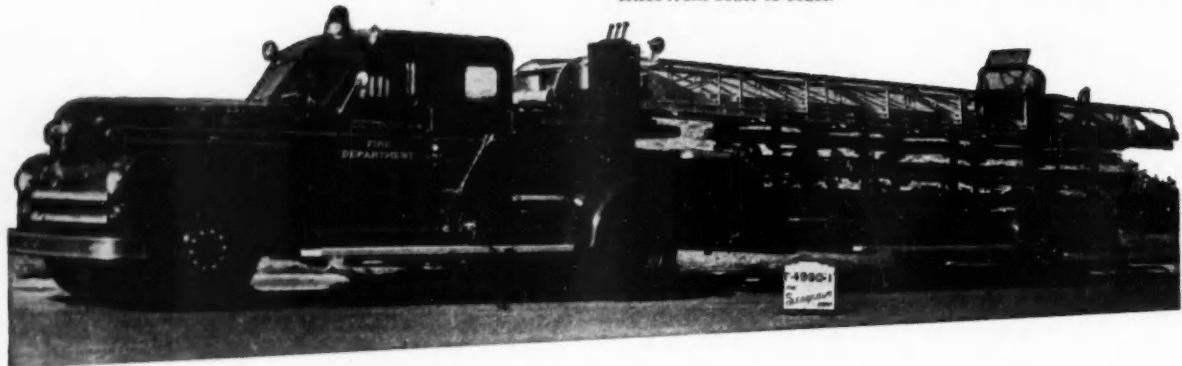
COTTA TRANSMISSION CO., ROCKFORD, ILLINOIS



**COTTA**  
**HEAVY-DUTY**  
**REDUCTION UNITS**

"Engineered-to-order"

NICKEL-CONTAINING ALLOYS CONTRIBUTE to the dependability of SEAGRAVE Fire Apparatus used in more than 3,000 cities from coast to coast.



## How Nickel helps SEAGRAVE

**add strength and safety...**

**cut bulk and deadweight...**

**minimize maintenance**

Built in the SEAGRAVE factory, especially for fire service, this precision built V-12 engine utilizes nickel alloyed iron blocks, heads and pistons produced by ALLYNE-RYAN FOUNDRY CO., Cleveland, Ohio.

This aerial ladder truck — the *entire apparatus, including frame, engine, pumps, controls* — exemplifies the type of complete product made by THE SEAGRAVE CORPORATION of Columbus, Ohio.

With no need of surplus bulk for strength, nickel alloyed bronzes enable SEAGRAVE to produce fine-grained, pressure-tight, machinable castings not only for fittings and small vane type pumps that operate ladders, but also for cast parts in their heavy duty, 4-stage pumps that raise water pressures up to 1000 p.s.i.

Engine castings, including blocks, heads and cylinders are specified in nickel alloyed cast iron to obtain strength and wear-resistance along with machinability in all sections, thick or thin.

Metal ladders and water tanks are fabricated from a low alloy high strength steel containing nickel, to obtain maxi-

mum weight reduction in these components without sacrificing strength or safety. Nickel alloyed steel of this type, produced under various trade names by leading steel companies, is used in strip form for ladders, and in sheets for the tanks.

And the unexcelled mechanical properties of case hardened nickel alloyed steel components in Timken rear axle units, complete with brake drums, contribute power-saving capacity to SEAGRAVE apparatus.

Nickel-containing alloys offer significant advantages wherever safety and dependability are essential. When you face a metal problem, send us the details for our suggestions.

At the present time, nickel is available for end uses in defense and defense supporting industries. The remainder of the supply is available for some civilian applications and governmental stockpiling.



**THE INTERNATIONAL NICKEL COMPANY, INC.** 67 WALL STREET  
NEW YORK 5, N.Y.

A CHILTON MAGAZINE



PUBLISHED SEMI-MONTHLY

# AUTOMOTIVE INDUSTRIES

JULY 1, 1953

VOL. 109, NO. 1

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National Business  
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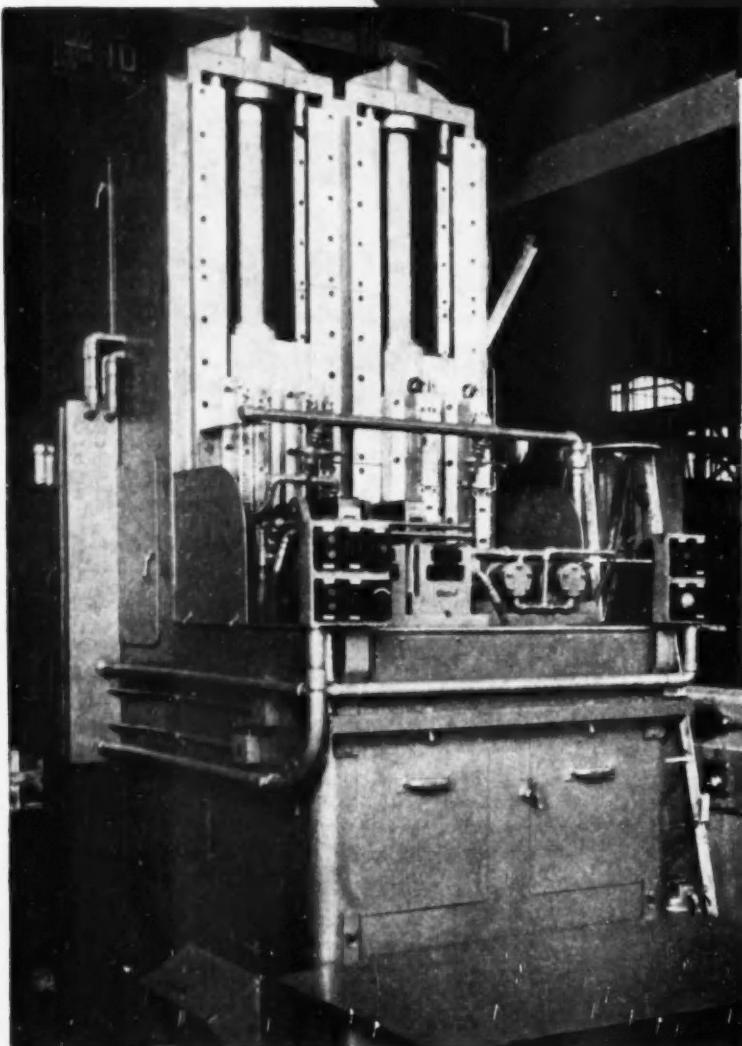
Audit Bureau  
of Circulations

AUTOMOTIVE INDUSTRIES is a consolidation of The Automobile (weekly) and the Motor Review (weekly) May, 1902; Dealer and Repairman (monthly), October, 1903; the Automobile Magazine (monthly), July, 1907, and the Horseless Age (weekly); founded in 1895, May, 1918.

EDITORIAL EXECUTIVE OFFICES, Chestnut and 56th Sts., Philadelphia 39, Pa., U. S. A. Cable address—Autoland, Philadelphia.

AUTOMOTIVE INDUSTRIES, Published semi-monthly by Chilton Co., Chestnut & 56th Sts., Phila. 39. Entered as Second Class Matter October 1, 1925, at the Post Office at Philadelphia, Pa.; Under the Act of Congress of March 3, 1879. In case of Non-Delivery Return Postage Guaranteed. Subscription price: United States, Mexico, United States Possessions, and all Latin-American countries, 1 year \$2.00, 2 years \$3.00. Canadian and Foreign, 1 year \$5.00, 2 years \$8.00; single copies, 25 cents, except Statistical Issue (Mar. 15th), \$1.00.

# WHY AMERICAN BROACH USES TEXACO



**T**HE American Broach & Machine Company of Ann Arbor, Michigan, a division of Sundstrand Machine Tool Company, uses hydraulic machine tools to make its own famous line of hydraulic broaching machines and broaching tools. And in these hydraulic machine tools, the hydraulic medium is Texaco Regal Oil (R&O).

*Why does American Broach use Texaco? Because Texaco Regal Oil (R&O) gives them these benefits —*

- freedom from rust, sludge and foam
- smooth, trouble-free operation
- longer pump and parts life
- lower maintenance costs

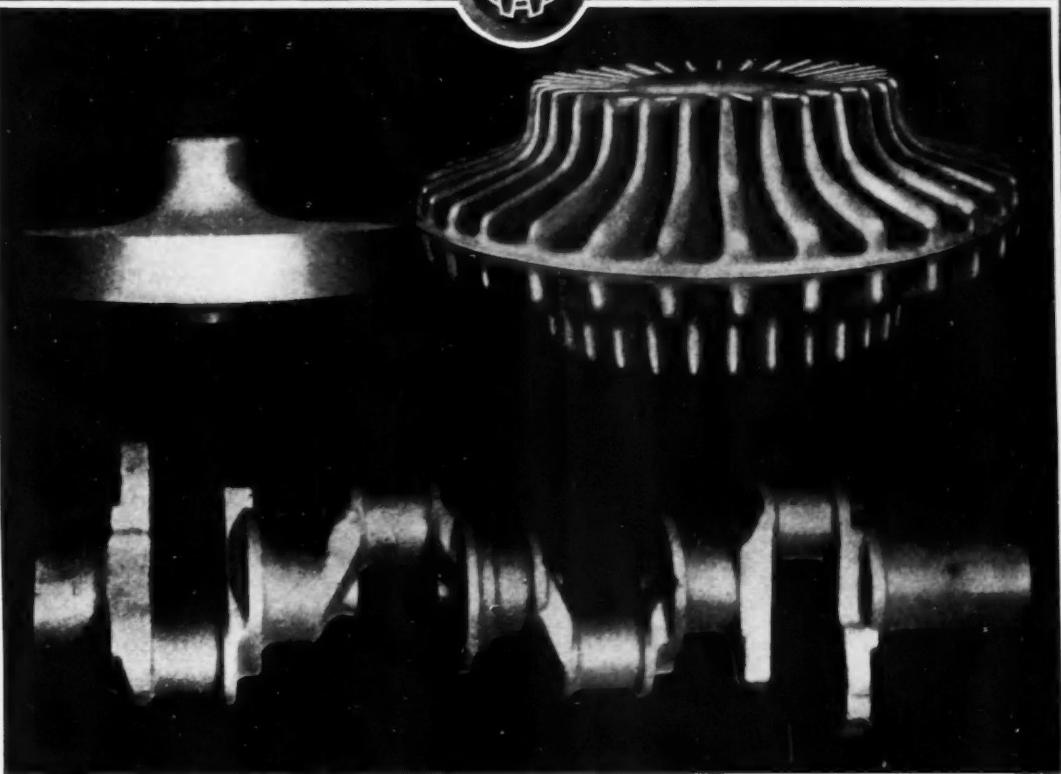
*Texaco Regal Oil (R&O) is turbine-quality oil improved by special additives and processing. Tested against ordinary turbine-quality oils, it shows more than ten times greater oxidation resistance and far superior rust- and foam-preventing ability.*

There is a complete line of Texaco Regal Oils (R&O) approved by leading hydraulic manufacturers. Let a Texaco Lubrication Engineer help you select the one best for your equipment and operating conditions. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y.



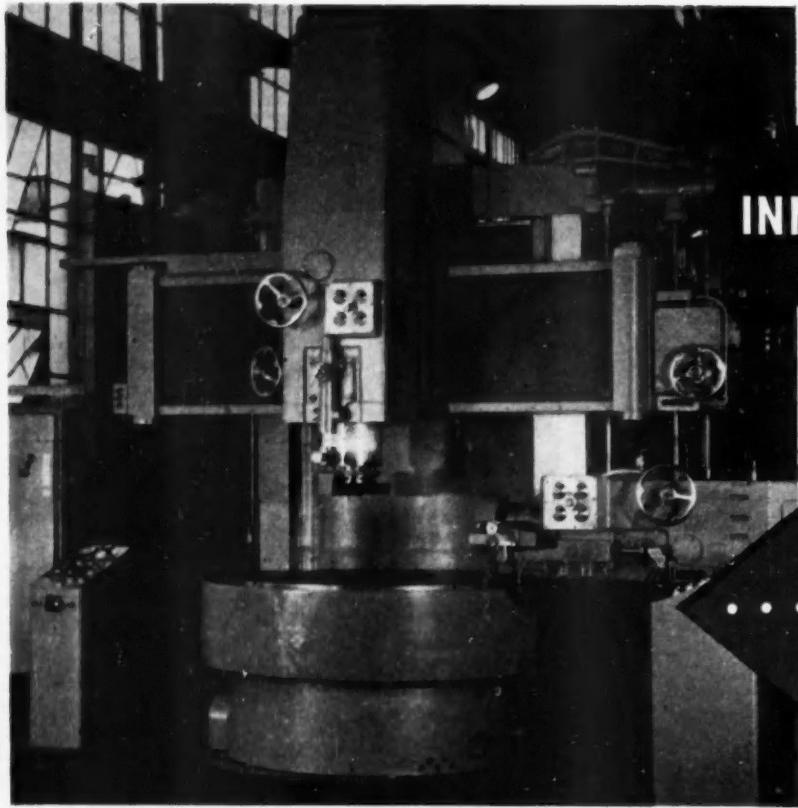
**TEXACO Regal Oils (R&O)**  
FOR ALL HYDRAULIC UNITS



**Wyman-Gordon**—specialists in the vital forgings of the internal combustion engine since its inception—is today the largest producer of crankshafts for the automotive industry and of all types of forgings for the aircraft industry. Be it crankshafts and other vital forgings for the piston type engines or turbine wheels and impellers for turbo jets—there is no substitute for Wyman-Gordon experience.

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HARVEY, ILLINOIS      DETROIT, MICHIGAN



AN  
INNOVATION  
*in*

## VERTICAL CHUCKING GRINDING MACHINES

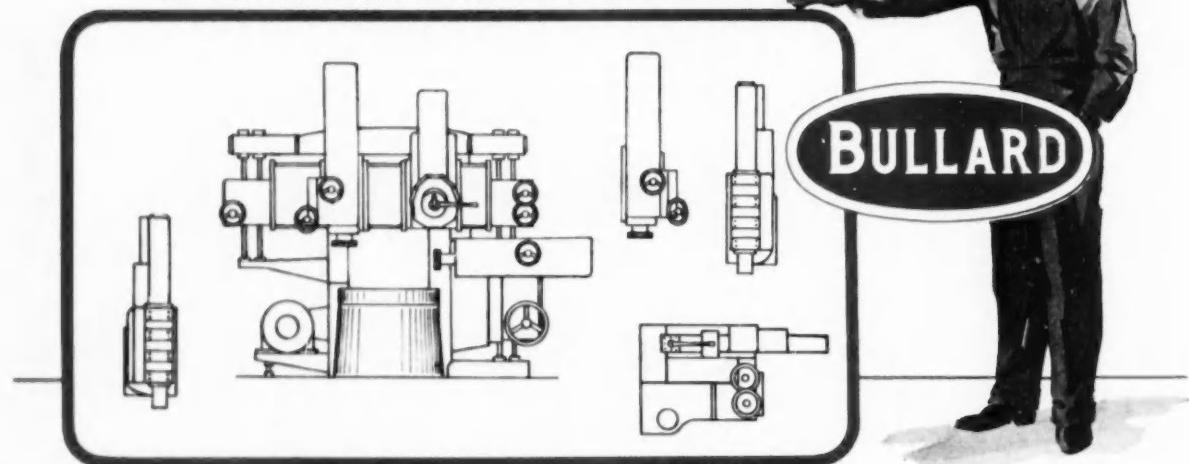
Your Grinding Jobs  
together . . . Keep the  
Machine Paying  
its Way . . .

**NOW . . .**  
*Practical Versatility*

**BY . . .**  
*Grinding, Boring, Facing or Turning with several head combinations available.*

**ASSURED**  
*Sufficient horsepower for regular machining cuts first . . .  
Grinding work next . . . on the SAME machine.*

POSSIBLE HEAD COMBINATIONS on BULLARD  
VERTICAL CHUCKING GRINDING MACHINES



**THE BULLARD COMPANY**  
BRIDGEPORT 2, CONNECTICUT

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# DSP

*leaf*  
**SPRINGS**



as original equipment  
in some or all of their  
current truck  
production

If you make trucks, buses, trailers, or other heavy vehicles, DSP offers you *all* these advantages:

**SPECIALIZED EXPERIENCE** that goes back to 1904—making leaf springs as original equipment for the automotive industry.

**SPECIALIZED EQUIPMENT**—to turn out dependable heavy leaf suspension springs. DSP has produced many millions of springs over a period of years, under exacting quality and metallurgical controls.

**SPECIALIZED ENGINEERING AND RESEARCH**—concentrated on *heavy leaf suspension spring* designs to carry specific loads and meet the most severe operating conditions.

The DSP plant is in Detroit, accessible to the main centers of truck production.



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Automotive Division  
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*Also Makers of Fenestra Building Products*  
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**Longer Valve Life for ALL Engines  
in ALL Types of Service**

**EATON** MANUFACTURING COMPANY

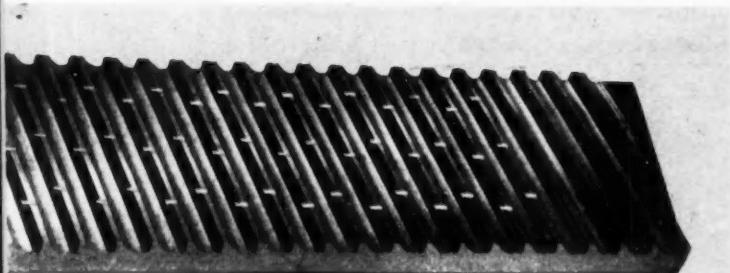
General Offices: CLEVELAND, OHIO

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**PRODUCTS:** Sodium Cooled, Poppet, and Free Valves • Tappets • Hydraulic Valve Lifters • Valve Seat Inserts • Jet Engine Parts • Rotor Pumps • Motor Truck Axles • Permanent Mold Gray Iron Castings • Heater-Defroster Units • Snap Rings • Springtites • Spring Washers • Cold Drawn Steel • Stampings • Leaf and Coil Springs • Dynamatic Drives, Brakes, Dynamometers

# WHEN BROACHING... SAVE WITH CARBIDES



**TOP:** Carbide tipped sections of a Continental Surface Broach. Note the chip breaker grooves in the semi-finishing teeth and the solid finishing teeth.

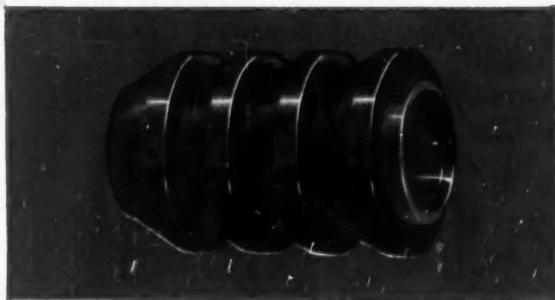
**MIDDLE:** Carbide tipped finishing section of a Continental broach used on a cast iron application.

**BOTTOM:** Rough cast-iron parts made it necessary to use this carbide tipped broach to obtain satisfactory tool life in cutting half-round slots.

With Continental Carbide tipped broaches you'll get more pieces per grind, more pieces per broach, and more pieces per dollar. They are especially effective on cast iron parts.

Carbide tips may be used in all the broach teeth or in the finishing teeth only. Continental Tool Works Division of Ex-Cell-O has the technical knowledge to help you; Continental has been designing and building solid carbide and carbide tipped cutting tools since 1930.

For information regarding your application, or for a quotation on carbide tipped broaches, just give your local Ex-Cell-O representative the details or write to Continental in Detroit.



Solid carbide shell used on the finishing end of a High-Speed steel broach to hold size in cast iron parts.

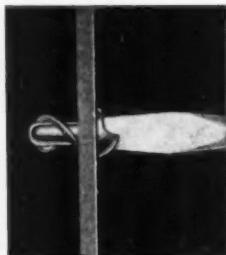
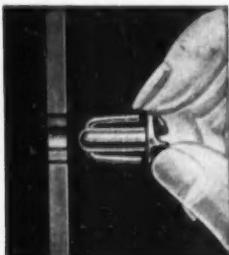


# Continental

TOOL WORKS

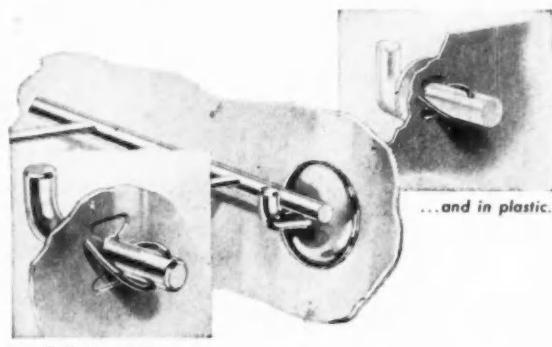
DIVISION OF EX-CELL-O CORPORATION  
DETROIT 32, MICHIGAN

# Have you a similar use for this 1-piece fastener?



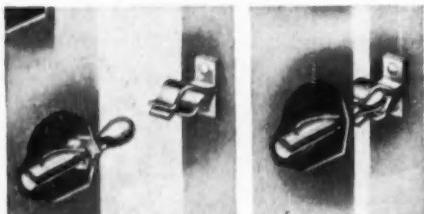
## It's a Blind Rivet

...Or a removable fastener. It locks and unlocks with a 90° clockwise rotation. No mating parts such as nuts or receptacles are required.



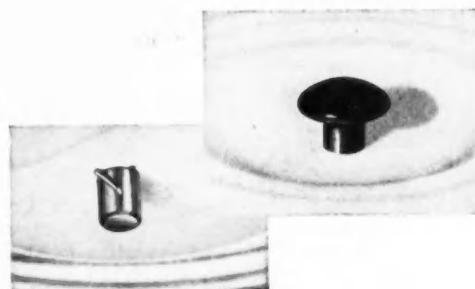
## It's a Shelf Support

...For ranges or refrigerators—in plastic and metal. Leading appliance makers have achieved substantial installation savings through its use.



## It's a Cabinet Door Strike

...Simple to install; eliminates welding and cuts assembly cost. Any head can be designed without affecting fastening principle.



## It's a Lifter Knob or Dashboard Plug

...Plastic Spring-Lock heads are molded around steel inserts, giving strength at point of load or impact.

Any shape head can be molded in any color.

### What's Your Application?

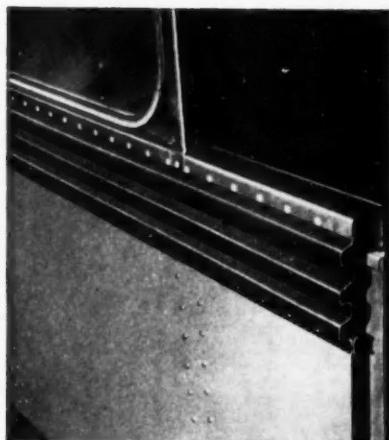
...Tell us how you can use Spring-Lock Fasteners in your products. We'll be glad to work out the details with you.

SIMMONS FASTENER CORPORATION  
1749 NORTH BROADWAY, ALBANY 1, N. Y.

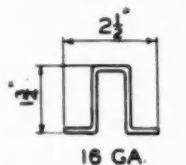
# Simmons

QUICK-LOCK  
SPRING-LOCK  
ROTO-LOCK  
LINK-LOCK  
DUAL-LOCK

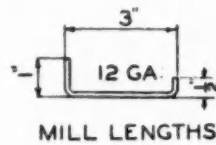
JUST OUT!  
NEW 36-PAGE CATALOG WITH APPLICATIONS  
SEND FOR IT!



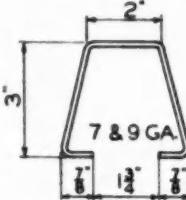
# ONE OF THESE MAYARI R SHAPES MAY GIVE YOU AN IDEA



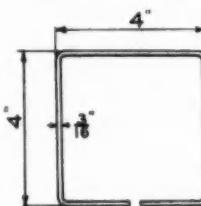
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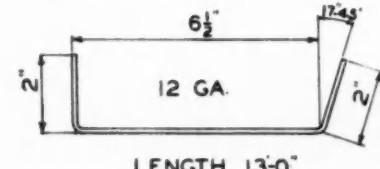
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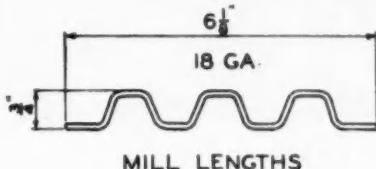
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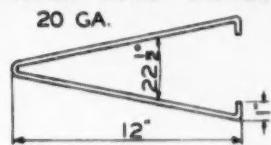
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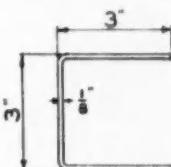
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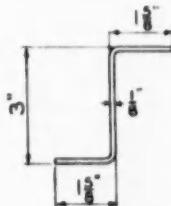
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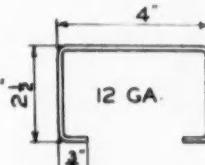
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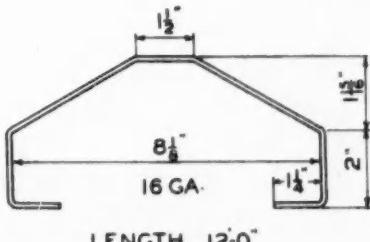
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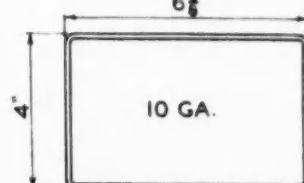
MILL LENGTHS



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LENGTH 12'-0"



LENGTH 7'-9"

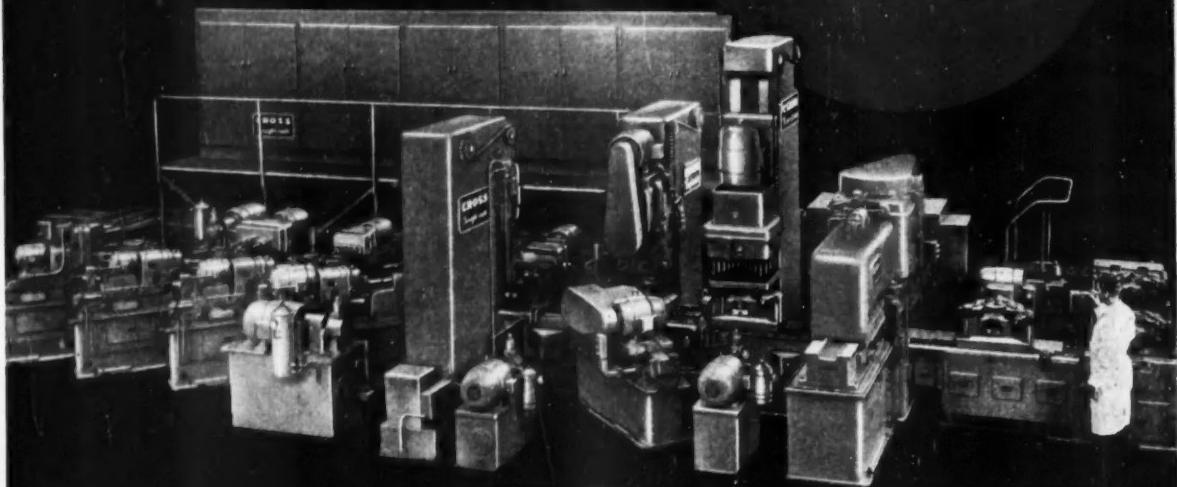
BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

**Mayari R makes it lighter...stronger...longer lasting**

*Another Transfer-matic by Cross*

**Completely  
Machines  
Exhaust  
Manifolds**

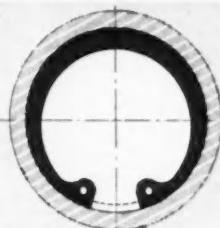
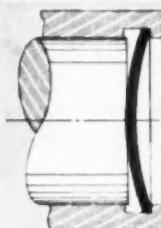


- ★ Machines right and left exhaust manifolds completely — 42 milling, drilling, boring, chamfering, and tapping operations.
- ★ 230 pieces (115 right and 115 left) per hour at 100% efficiency.
- ★ Ten stations—one loading, one unloading, three milling, three drilling, one boring, one tapping.
- ★ Palletized work holding fixtures with power wrenches for automatic operation.
- ★ Cross-Drive for milling cutters.
- ★ Other features: Built-in chip conveyor and automatic removal of chips from fixtures after each cycle, pre-set tools, J.I.C. standard construction, automatic lubrication, hardened and ground ways.

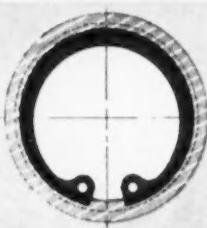
*Established 1898*

THE **CROSS**  
DETROIT 7, MICHIGAN  
*Special MACHINE TOOLS*

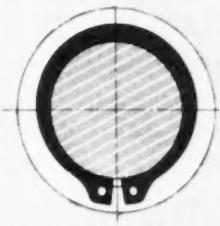
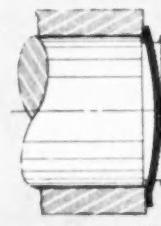
**if end-play take-up is a problem  
one of these special Waldes Truarc rings can solve it**



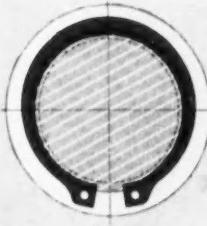
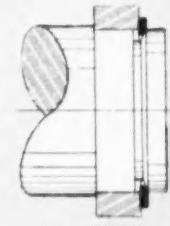
**series 5001 • internal type**  
for bore diameters from: .250 — 1.456 in.



**series 5002 • internal type**  
for bore diameters from: 1 — 10 in.



**series 5101 • external type**  
for shaft diameters from: .188 — 1.438 in.



**series 5102 • external type**  
for shaft diameters from: 1 — 10 in.

**bowed WALDES TRUARC RETAINING RINGS**

Take up end-play resiliently, damp vibrations and oscillations. Bent like a bow out of plane at horizontal center line. The bowed Truarc ring acts in axial direction like a floating spring without losing its tight grip against the bottom of the groove.

Maximum resilient end-play take-up: .015" to .020" depending on size of ring.

**beveled WALDES TRUARC RETAINING RINGS**

Take up end-play rigidly. When the ring is contracted (or expanded), the tapered edge acts like a wedge moving deeper into the groove and shifting in an axial direction until the ring abuts the machine part.

Maximum end-play take-up, depending on ring size: internal types, .005" to .043"; external types, .005" to .040".

**WALDES TRUARC is much more than a better way to hold parts together**

Thousands of manufacturers have already found that Truarc Retaining Rings cut production costs and speed assembly by simplifying product design. But that's not all.

Waldes Truarc engineers have extended the use of retaining rings by developing rings that perform additional functions while acting as retaining shoulders. Those

shown here take up end-play, compensate for wear and varying manufacturing tolerances.

No matter what your problem, there's a Waldes Truarc Ring designed specifically to solve it. Send us your drawings, your questions—Waldes Truarc engineers will work with you, at no obligation.

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**TRUARC**

REG. U. S. PAT. OFF.

**RETAINING RINGS**

WALDES KOHINOOR, INC., LONG ISLAND CITY 1, NEW YORK

WALDES TRUARC RETAINING RINGS AND PLIERS ARE PROTECTED BY ONE OR MORE OF THE FOLLOWING U. S. PATENTS: 2,392,947; 2,392,948; 2,419,851; 2,420,921; 2,428,341; 2,439,795; 2,441,846; 2,455,160; 2,453,060; 2,453,061; 2,457,052; 2,467,003; 2,468,094; 2,509,081 AND OTHER PATENTS PENDING.



Waldes Kohinoor, Inc., 47-16 Austel Place, L. I. C. 1, N. Y.

Please send me the new Waldes Truarc Retaining Ring catalog.

AY-075

(Please print)

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Business Address \_\_\_\_\_

City \_\_\_\_\_ Zone \_\_\_\_\_ State \_\_\_\_\_

# LABORATORY TESTED



## for meeting thousands of rigid demands...

The remarkably wide range of uses to which components made and processed by Western Felt is astonishing.

It is serving in scores of industries—from women's hats to 50 ton forge hammers. In the automobile field alone, as an example, this felt has been chosen to best serve in more than thirty purposes per car.

Western Felt engineers and chemists for decades have worked in close cooperation with users of felt to give them the very highest quality of material, exactness and uniformity. There are still a world of potential uses for Western Felt products, made to almost any shape, size or consistency.

They range from wool-softness to rock-hardness.

When cut, it does not fray or lose shape. It can be cut to close tolerances for such products as gaskets, washers, channels, grommets, filters, seals, etc. It can be made waterproof and fungus-proof and flame resistant. Ask Western Felt engineering co-operation—they have specialized knowledge to aid you.

*Sheet and roll felt manufactured for special purposes and to meet all S.A.E. and military specifications.*

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**Felt WORKS**

MANUFACTURERS AND CUTTERS OF WOOL FELTS

# Delpark FILTERS PAINT

FROM PAINT SPRAY BOOTH WATER  
AT  
**FORD MOTOR COMPANY**  
**DALLAS, TEXAS PLANT**

● Keeping paint spray booth water clean has presented many difficult problems. These problems are the result of the over-spray in the wash water system which can not be entirely eliminated by hand skimming. By using proper compounds, flocculation of the over-spray paint particles creates a floating matte on the surface of the water. Through the use of automatic skimming and DELPARK *Industrial Filters* complete and continuous removal of the matte is easily accomplished. Costly hand-skimming is eliminated and tank cleaning requirements reduced to a minimum.

By automatic skimming and filtration, at short intervals or continuously, paint particles are constantly removed and not allowed to settle in the spray booth tank or circulate through the system. Plugged pumps and nozzles and paint sludge deposits in the eliminators are no longer a problem.

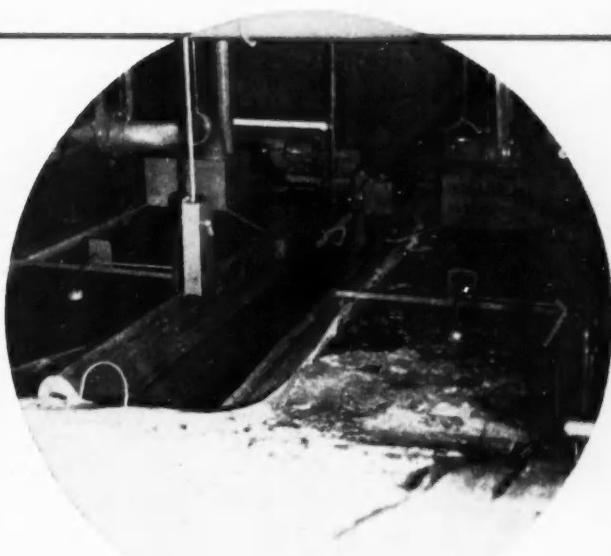
DELPARK Engineers are available for consultation with customers on the most satisfactory method of delivering the paint and water to the filter.

Write today for more complete information

Backed by More Than 30 Years in Industrial Filtration

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Gentlemen: Please send more information on Paint Spray Booth Applications of DELPARK *Industrial Filters*.

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Company \_\_\_\_\_

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# Gas engines or Diesel... South quick starting



Model 978 MF  
20,000 BTU/hr.  
fresh air output

from one heater...

**engine pre-heating plus personnel heating plus defrosting. Models for every requirement.**

Here's powerful, sure pre-heating for brutally tough-to-start diesels as well as gas engines of every type. Compact, adaptable, dependable South Wind Pre-Heating Systems assure the quick starting required by Military Services even at 65° below! One heater provides engine pre-heating - cab heating - defrosting!

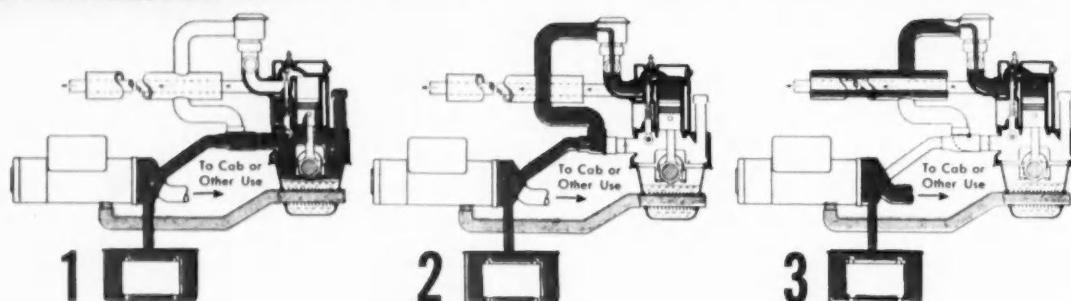
South Wind Pre-Heating Systems reduce battery drain by reducing starting torque, cut the cost of starting aids. They eliminate shock loads imposed

by brute-force starting methods, prolong engine life and lower maintenance cost.

Only clean, dry air is fed to engines by South Wind Pre-Heating Systems. They permit use of optimum viscosity lubricants and assure normal lubrication at all times. Inhibit sludge formation and freeze-up of engine accessories, too.

South Wind's equipment for internal and external pre-heating includes units of 20,000, 30,000, 50,000, 60,000, 90,000, 100,000, 200,000, 600,000 and 700,000 BTU/hr. capacity. South Wind's experienced field engineers will be happy to consult with you on any pre-heating problem, whatever its scope or complexity. Write today to: South Wind Division, Stewart-Warner Corporation, Indianapolis, Indiana.

## South Wind 3-Phase INTERNAL PRE-HEATING



### Pre-Heat Phase

Clean, dry hot air is used to pre-heat critical engine moving parts directly and to remove damaging moisture from the engine interior — before engine cranking is attempted. (Note: Heat duct to the cab for heating and defrosting remains closed until after the engine is started.)

### Starting Phase

Heat into engine crankcase is diverted (as shown) to air induction system to elevate temperature of fuel-air mixture and promote rapid, normal combustion in chambers. Internal pre-heating of critical parts and normal lubrication frees bearings, shafts, pins and pistons from starting strain and friction wear.

### Operational Phase

After easy starting, normal engine operating conditions are sustained. Now, South Wind's clean heat can be used to heat the cab, defrost windshields and supply engine induction air heat. (Note: Illustration shows how normal engine induction air temperature can be sustained by engine exhaust heat exchanger.)

# Wind pre-heating systems assure even at 65° below!

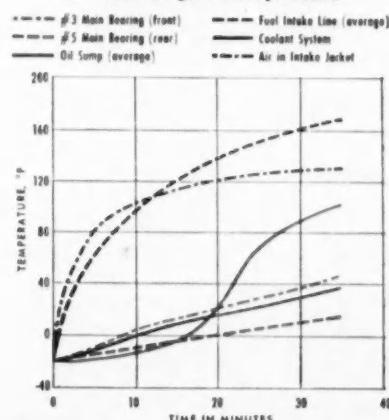
## Studies Prove South Wind Superiority

South Wind's entirely new principle of scientific pre-heating has been developed, tested and proved in the field, as well as in Stewart-Warner's Laboratory Cold Room.

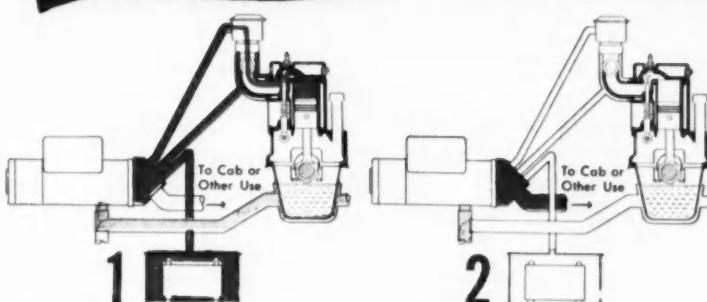
Here is typical temperature record of critical engine components during pre-heating (only minimum capacity 70,000 BTU/hr. pre-heater kit used). This heat provided adequate temperature rise for easy starting — with less than 5-seconds cranking.

Data is based on a 6-cylinder, 2-cycle 225 HP Diesel engine weighing 3,000 pounds.

Temperature vs. Time  
of Diesel Engine Components



## South Wind 2-Phase EXTERNAL PRE-HEATING



### Pre-Heat Phase

Clean, dry hot air is applied to the exterior surface of the carburetor and intake manifold, and to the battery, by the use of shrouds. The oil sump is heated in like fashion by hot gases from the heater exhaust. (Clean, hot air which enters the air intake is, in some cases, provided for the starting phase.)

### Operational Phase

After starting engine, clean, hot air from the heater is diverted to cab for personnel heating, defrosting and other use. (If the application demands, part of this air can be used to provide continuous heat for battery and/or air induction system.) Heater exhaust is diverted directly to atmosphere.



**South Wind**  
A PRODUCT OF  
**SW**  
STEWART & WARNER  
PERSONNEL HEATING  
ENGINE AND  
EQUIPMENT PRE-HEATING  
WINDSHIELD DEFROSTING

# CHANGE Resistance Welding Die Set-ups ... In a Matter of Seconds



*Mallory "Nu-Twist" Die Adaptors provide complete flexibility in welding operations with one die set-up*

Now, you can switch from one job to another without changing dies . . . and you can do the entire job in a matter of seconds. Mallory "Nu-Twist" Die Adaptors are designed so that all the operator has to do is turn the locking nut by hand, slide out the electrode insert, slip in the one for the next job and turn the locking nut. It is simple as that . . . requires no tools.

Shops having small run resistance welding applications such as projection welding, single spot welding and electrical upsetting can effect substantial savings in set-up time and reduce die inventory. Die adaptor bases are custom designed to fit your machine specifications. Standard electrodes are available from stock. Special shapes can be designed to fit most requirements.

*For complete information either write us or ask your Mallory Distributor for a copy of Technical Bulletin 8-28.*

*Expect more  
Get more  
from MALLORY*

**Electrode inserts give more flexibility . . .  
less down time.**



Typical electrode for projection welding using an insulated locating pin.



Electrode insert for spot and mash welding, electrical upsetting or single projection welding.



Electrode insert for typical projection welding operation.

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## **Revere Electric Welded Steel Tubing**

**Available from  $\frac{1}{4}$ " to  $4\frac{1}{2}$ " O.D. —**

**Walls from .025" to .187"**

A leading maker of appliances was using a heavy tubular member as a wringer post extension. With the collaboration of Revere Steel Tube engineers, the manufacturer developed a simple fabricated part of Revere Electric Welded Steel Tube, supplied ready for assembly. This reduced the thickness of the tube wall by half, cutting costs considerably and making the machine somewhat lighter and thus more attractive to users.

Revere offers you Electric Welded Steel Tube in the shapes shown here, and many others. The tube can be made so it is impossible to find the weld. Our Technical Advisory Service will gladly collaborate with you on applications to your product.

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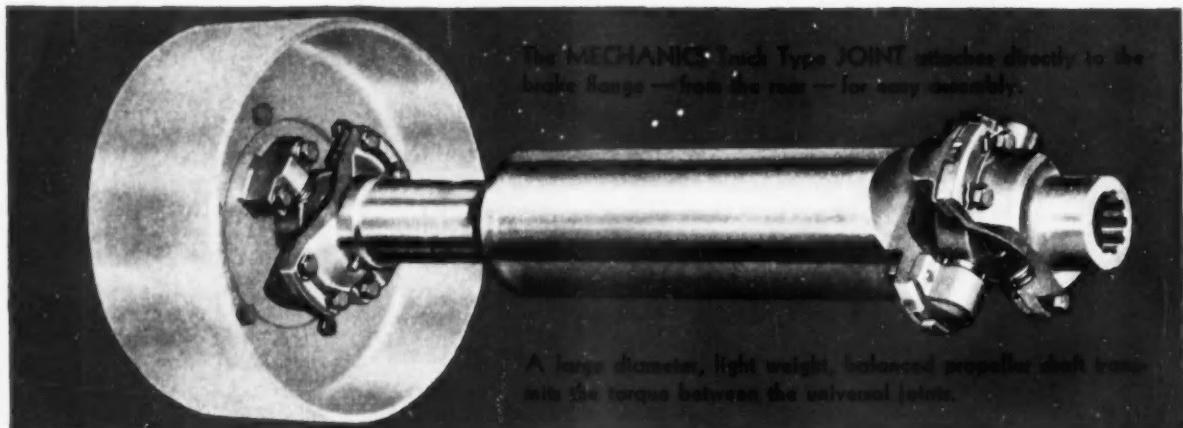
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ON NBC TELEVISION, SUNDAYS**

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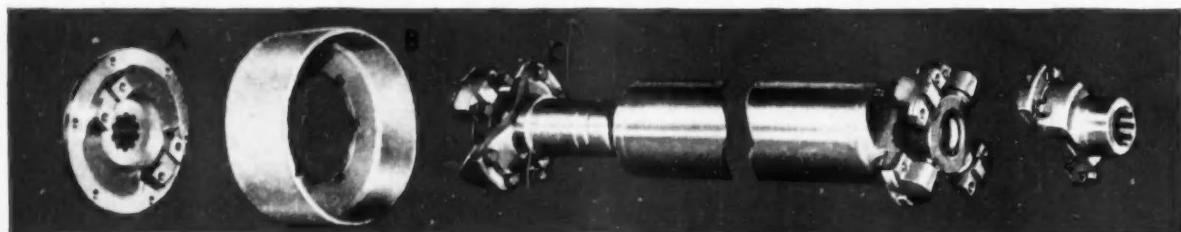
MECHANICS Roller Bearing UNIVERSAL JOINTS for Trucks are specially designed with less parts and connections for easy assembly

and servicing — smooth running balance — Maximum strength with less weight — and long, trouble-free, safe operation.



MECHANICS Truck Type JOINTS are assembled by attaching joint C to brake flange A independent of fastening between drum B and

flange A; making possible servicing drum or joint, without disturbing other attachments or altering original brake drum or propeller shaft balance.



Let MECHANICS engineers help give your trucks or other heavy duty machines these competitive advantages.

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## **the case of the broken fan blades**

When the high incidence of breakage in a special cast aluminum cooling fan created a critical problem, technicians laid the blame to high rotational speeds.

Alcoa engineers thought otherwise. Into our 80,000 rpm "whirl pit" went a sample fan, covered with a brittle lacquer that shows where cracks occur. Stopping at intervals for inspection and photographs, speeds were stepped up past the operating maximum of 5,500 rpm, past the safety margin at 6,500 rpm. Far above that speed, the fan shattered.

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Alcoa testing facilities like the "whirl pit" are a regular part of our service. You can bring them to bear on your problem by calling your Alcoa sales engineer, who is listed in the yellow pages of your telephone directory.

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Please send me a copy of your "Road Map to a Better Product" outlining Alcoa's research and development facilities.

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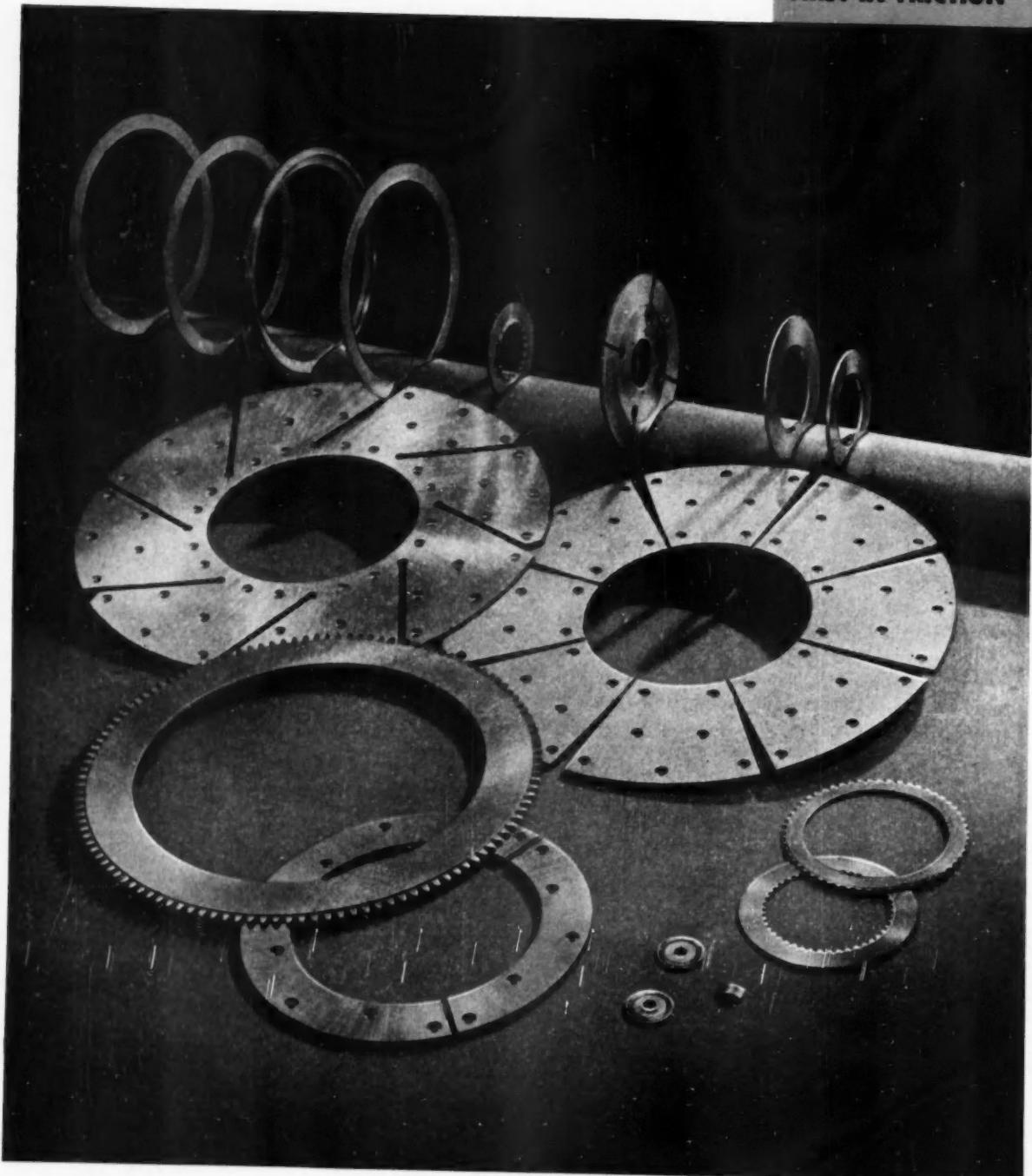
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City \_\_\_\_\_ State \_\_\_\_\_

**R  
M**

FIRST IN FRICTION

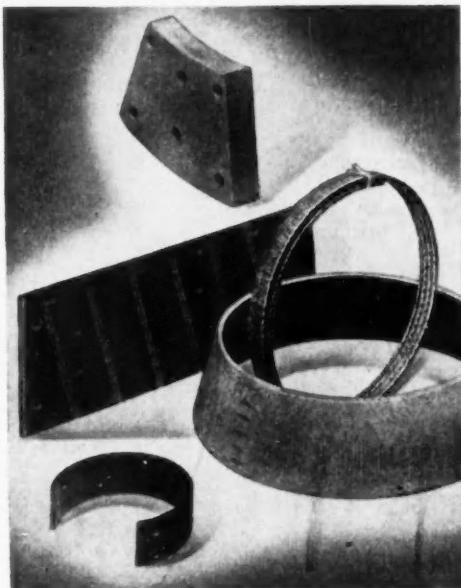


# More and more special friction problems are being solved by **R/M SINTERED METAL PRODUCTS**

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Ever since sintered metal entered the picture as a friction material, Raybestos-Manhattan's research and development facilities have been busy. All of R/M's know-how and experience have been utilized in developing sintered metal products for specialized applications in the automotive, aviation and earth-moving industries. It is exceptionally suitable for applications requiring close tolerances, or for operating conditions such as immersion in oil.

Perhaps you have a friction material problem that sintered metal could solve. You can find out by talking to your R/M representative. Behind him are the advantages offered by the world's largest maker of friction materials . . . seven great plants, their research departments, their testing laboratories.



R/M's complete line of friction materials includes woven and molded asbestos parts in the form of blocks, segments, discs, cones, collars, and many special shapes.

*Write for our engineering bulletin outlining recent developments in friction materials for brake linings, clutch facings, and special shapes and sizes.*

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# Famous for "firsts"... **BELL** Aircraft

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 by **BELL** Aircraft

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 Presses

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**FIRST**  
 Aircraft to Vary Wing  
 Sweepback in Flight (X-5)

**FIRST**  
 Jet-Propelled Fighter in  
 U. S. (F-59)

**FIRST**  
 Commercially Licensed  
 Helicopter

Record of  
**LAKE ERIE**  
 PRESS PURCHASES  
 by **BELL** Aircraft

DATE	NUMBER	TONNAGE
1937	1	750
1939	1	2500
1940	1	275
1941	1	275
1942	1	5000
1943	1	275
1943	1	5000
1943	2	275
1943	4	500
1951	1	400
1952	1	7000



**ABOVE.** New 7,000 ton press is shown producing Bell helicopter parts...in this instance left-hand aft sills for the HSL-1 engine compartment. Material is 58.00" long by 6.50" wide by .091" thick. Two flanges and a contour are formed. Depth of draw is 3". Pressure required is 5,000 tons. Another new Lake Erie press appears in the background. It is a triple action model with a 400 ton capacity.

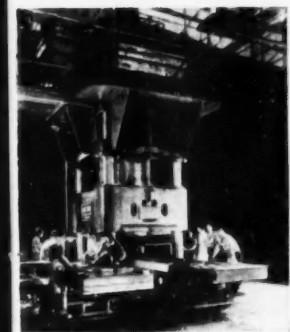
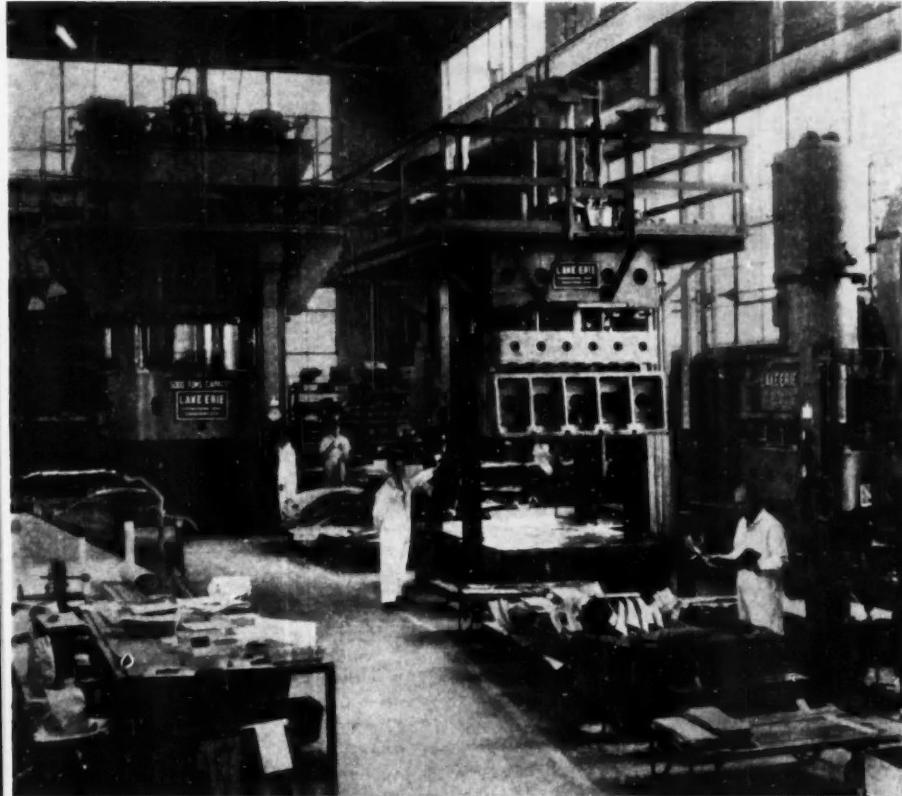
● Other prominent  
 Lake Erie Press users in  
 the Aircraft Industry

Aeronca Aircraft Corporation  
 AiResearch Manufacturing Company  
 Beech Aircraft Corporation  
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 Bendix Aviation Corporation  
 Boeing Airplane Company  
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 General Electric Company  
 Aircraft Gas Turbine Division  
 Goodyear Aviation Corporation  
 Grumman Aircraft Engineering  
 Corporation

# places LAKE ERIE FIRST

## ...when it comes to Hydraulic Presses



**ABOVE.** A corner of the press room in the Bell Aircraft plant at Buffalo shows three Lake Erie presses with capacities of 5,000 tons, 750 tons and 275 tons respectively. The range in sizes and types, and the versatility of Lake Erie presses are a big asset to airframe, jet engine and accessory manufacturers.

**LEFT.** Bell's 5,000 ton Lake Erie press shown equipped with a rubber pad. Lake Erie presses of this type are available in capacities from 500 to 7,000 tons producing up to 2,000 p.s.i. on the work. High speed hydraulically operated loading tables or electrically operated tables (as shown above) are available for all press sizes.

**The 15th Lake Erie Press  
Purchased by Bell is a 7,000  
Ton Unit for the New Helicopter  
Plant at Fort Worth**

Bell Aircraft Corporation purchased its first Lake Erie press in 1937. Since then, 14 additional Lake Erie Presses have been added. These 15 presses have 5 different designs and six different capacities ranging from 275 to 7,000 tons. This year-in year-out satisfaction of Bell Aircraft and the variety of Lake Erie equipment involved are significant:

- 1** They reflect the competence and versatility of Lake Erie designers and builders.
- 2** They demonstrate that Lake Erie presses do their jobs with gratifying efficiency.
- 3** They prove that Lake Erie presses give years of the utmost satisfaction.

These are sound reasons why it is always good business to call in Lake Erie when hydraulic presses are under consideration.

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HYDRAULIC  
PRESSES**

**LAKE ERIE ENGINEERING CORP.**

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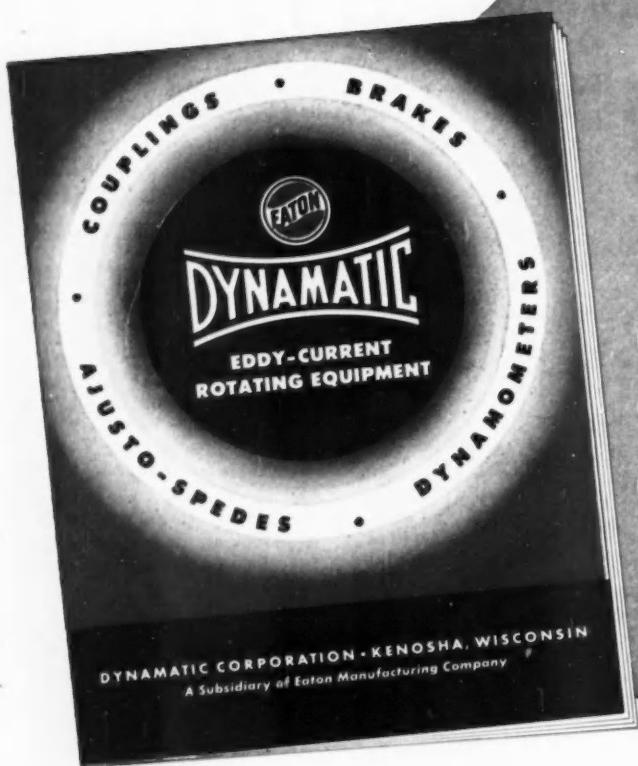
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## Add this New Bulletin to Your File on Eddy-Current Couplings, Drives, and Brakes

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## BROACHING MOTOR COUPLINGS WITH AN AMERICAN STANDARD KEYWAY BROACH

A simple operation yet requiring accuracy is the production broaching of keyways in motor couplings.

In this tooling set up the operator is not required to remove the American keyway broach from the pull head as he threads the part over the broach onto a work horn. High production is obtained as a part is loaded on each return stroke.

Whether your problem is keyways or complicated involute splines, American broach engineers can design the proper broach to produce parts to your requirements.

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Let American quote on your broaching requirements — machines, broaches and fixtures. Send a part print and full information.

### COMPLETE BROACHING INFORMATION

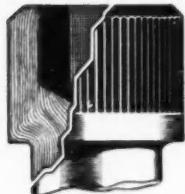
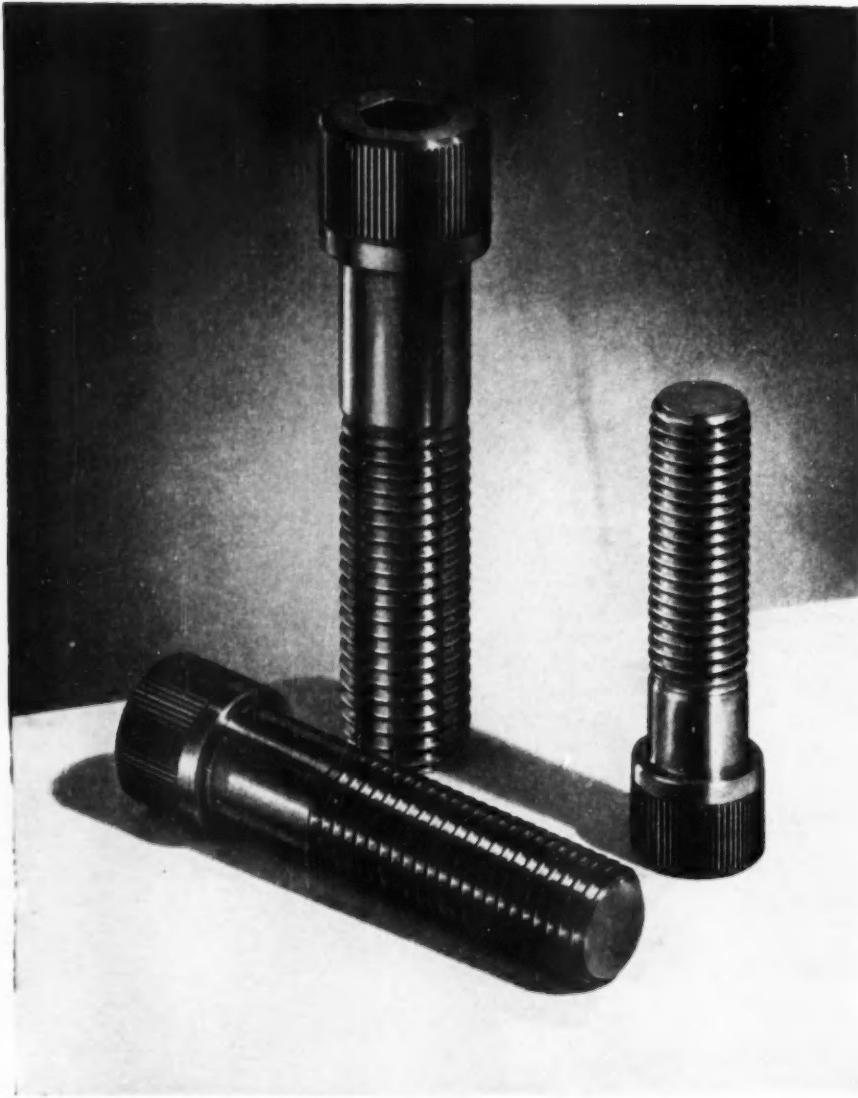
Over 5,000 copies of Catalog 450 have been distributed . . . get your copy now of this informative data book on American Broaches. Photographs . . . drawings . . . charts and case histories of broaching tools. Write today for your copy!



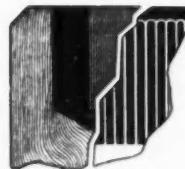
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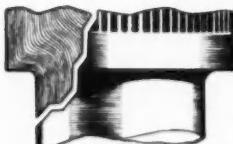
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A START FOR THE FUTURE



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FILLET. Completely formed to provide maximum resistance to shear and continuous grain flow throughout length of screw.

## There's much more to an UNBRAKO than meets the eye

When you pick up a socket cap screw, you don't stop to examine it—it's so commonplace.

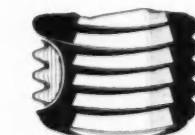
If you did, and it's an UNBRAKO, you'd marvel at the knurled head, the uniform hex socket, the smooth shank, the precision threads, all combined to make a strong, close tolerance fastener.

Quality control—from the selected alloy steels to the finished product—makes an UNBRAKO Socket Cap Screw what it is, the finest you can buy. Write for UNBRAKO Standards. SFS, Box 53, Jenkintown, Pa.

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JENKINTOWN PENNSYLVANIA

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### LOW PEDAL POWER BRAKE

specified by more  
car manufacturers  
than any other make

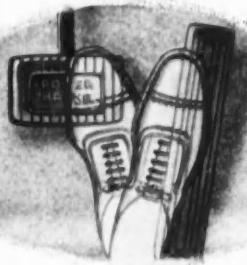
Bendix  
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## for

### The Only Performance-Proven Low Pedal Power Brake

NOW *Stopping*  
IS AS EASY AS *accelerating*



It is no longer necessary to lift the foot and exert leg power pressure to bring your car to a stop. With the Bendix Low Pedal Power Brake on about the same level as the accelerator, an easy ankle movement, much like working the accelerator, is all the physical effort required for braking. And by merely pivoting the foot on the heel, shifts from "go" to "stop" controls are made in far less time.

*Result:* MORE DRIVING COMFORT, LESS  
FATIGUE AND GREATER SAFETY.

Car manufacturers, here is a sure answer to the problem of creating added interest in your line of cars. Equip your vehicles with Bendix\* Low Pedal Power Brake, the sales feature that has already established itself as one of the most popular devices offered the public in years.

Dealers are enthusiastic because with the Bendix Low Pedal Power Brake it is now easy to demonstrate added braking power and safety. Service managers are happy because of its trouble-free performance and, best of all, new car buyers realize that with today's trend toward "power" operation, a car equipped with a Bendix Low Pedal Power Brake offers the ultimate in braking efficiency.

Remember, too, this new low pedal power brake is the product of Bendix, world's largest producer of power brakes and leader in braking developments since the earliest days of the industry. That's why if you are contemplating power braking it will pay to "Sign Up" with Bendix for the greatest improvement in braking since four wheel brakes.

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# AUTOMOTIVE INDUSTRIES

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*Asst. Treas.*—GEORGE MAISWINKLE

## High Spots of This Issue

### ★ New Tooling and Methods for Powerglide Transmissions

The favor which the Powerglide transmission has been accorded by motorists has necessitated stepping up production of the device at the Chevrolet-Cleveland plant. New tooling and techniques devised are described. Page 48.

### ★ New Radiator Test Facilities

Operations at Harrison Div. of GM Corp. epitomize coordination between engineering research and product design. The manner in which this aim is carried out on materials and ideas for heat transfer equipment is covered. Page 54.

### ★ SAE Summer Meeting Highlights

An extensive program of technical sessions and committee meetings kept members busy at the recent SAE gathering in Atlantic City, N. J. A total of 31 papers were presented at the affair, some of which are abstracted here. Page 58.

### ★ United Nations Study of Motor Vehicle Industries

In spite of the many pressing political problems on its agenda, the UN recently found time to make a world-wide survey of the motor vehicle situation and its future outlook. The interesting analysis is intriguing. Page 64.

### ★ Purchasing, Shot Peening . . . Top Subjects of Gear Meeting

Attendance at the recent AGMA Meeting in Hot Springs, Va., was quite high, and those present heard a number of interesting papers. Those on shot peening and purchasing were among the outstanding and are abstracted here. Page 68.

### ★ 31 New Product Items And Other High Spots, Such As:

A comparison of fuels in city-bus operation; cars on credit; atomic energy pilot plants; vehicle production in Japan continues at high rate; a better landing gear strut for the Boeing B-47 bomber; Mack brings out new Diesel engine; and casting of magnesium and selection of resin dealt with in latest shell mold developments.

*Automotive and Aviation News, Page 17*

*Complete Table of Contents, Page 3*

AUTOMOTIVE INDUSTRIES COVERS  
PASSENGER CARS • TRUCKS • BUSES • AIRCRAFT • TRACTORS • ENGINES  
• BODIES • TRAILERS • ROAD MACHINERY • FARM MACHINERY  
PARTS AND COMPONENTS • ACCESSORIES • PRODUCTION EQUIPMENT  
ENGINEERING • SERVICE EQUIPMENT • MAINTENANCE EQUIPMENT  
PRODUCTION • MANAGEMENT

# HYDRO-BROACHING WITH AUTOMATIC FIXTURES

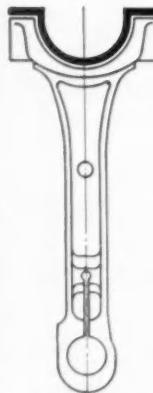
**Gets 290 sets of parts  
per hour**

Caps and connecting rods for automotive engines are usually required in large volume, and those broached on the equipment illustrated here are no exception. To meet the production requirements of 580 parts per hour (290 pairs) Cincinnati Application Engineers tooled up a No. 10-66 Duplex Vertical Hydro-Broach with two labor-aiding mechanically actuated automatic fixtures. Each holds one pair of parts—a cap and a rod. Clamping and unclamping are automatic... the operator is concerned only with positioning and removing the work. ¶ Several Hydro-Broach features contribute to the uniformly high production required for work of this type. Because of the alternating cutting cycles for the rams and tables, broaching is practically continuous; ways are hardened, ground and automatically lubricated for long productive life span; pre-set cycle control safeguards the operator. ¶ Our Application Engineers will give you the benefit of their experience in recommending and tooling up new CINCINNATI machines—milling or broaching—for the lowest cost production of your high priority work. And if you're not familiar with the new CINCINNATI Duplex Vertical Hydro-Broach Machines with receding tables, write for literature.

**THE CINCINNATI MILLING MACHINE CO.  
CINCINNATI 9, OHIO**

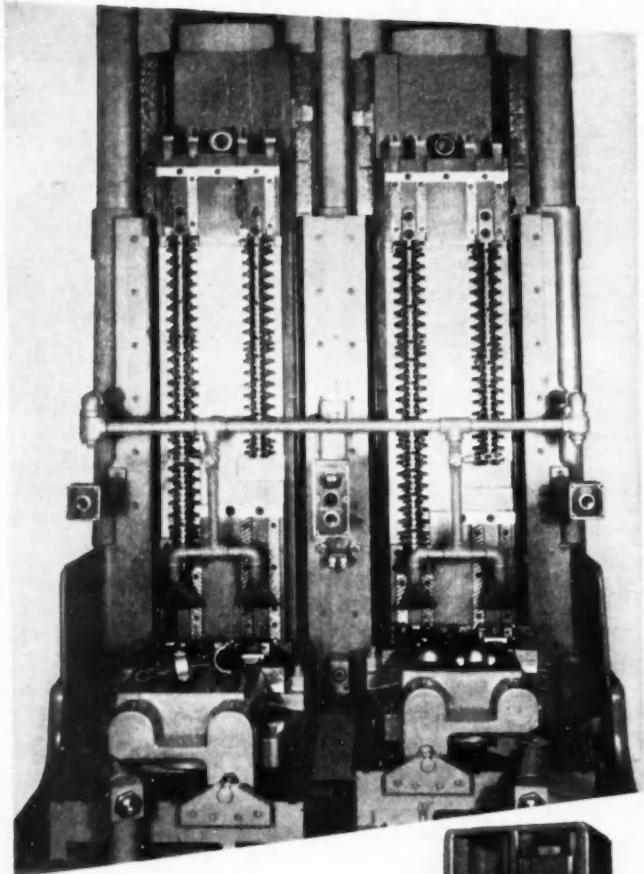
# CINCINNATI

MILLING MACHINES • CUTTER SHARPENING MACHINES  
BROACHING MACHINES • FLAME HARDENING MACHINES  
OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

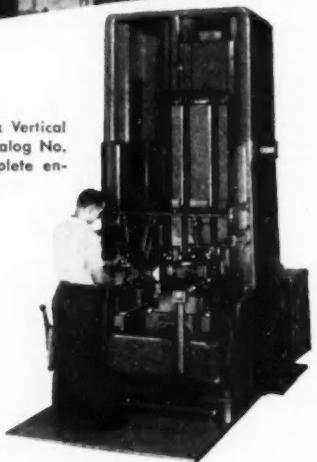


Drawing of connecting rod and cap broached on the All-Cincinnati equipment illustrated here:

Part name.....	Connecting rod and cap
Material .....	Steel forging
Operation .....	Broach half bore and parting face
Depth of cut.....	$\frac{1}{2}$ "
Broaching speed.....	34 feet per minute
Production .....	580 parts (290 pairs) per hour
Machine .....	CINCINNATI No. 10-66 Duplex Vertical Hydro-Broach



CINCINNATI No. 10-66 Duplex Vertical Hydro-Broach. Write for Catalog No. M-1745 which contains complete engineering specifications.



# News of the AUTOMOTIVE AND AVIATION INDUSTRIES

Vol. 109, No. 1

July 1, 1953

## Tooling Troubles Slow Chrysler Drive Output

Chrysler is stepping up production of its PowerFlite automatic transmission but still is far short of its needs because of tooling delays. Installation now is confined to the Imperial line, and it is doubtful whether enough will be available to extend it to other lines in the Chrysler Div. for several months yet. Presumably, the new drive also will be used by De Soto, Dodge, and possibly Plymouth when new models are announced later this year.

The transmission is being built at the Indianapolis plant, where production soon will be stepped up to 1400 a week. A great deal of improvised tooling is being utilized pending completion of high-production automatic machinery which is on order with machine tool builders.

The transmission is said to have 185 major parts. It also has fewer moving parts, according to Chrysler, with only nine sliding valves to actuate shifts. It has a light weight of only 214 lb.

## Britain, Germany Agree on Exports of Autos

A move toward automobile exchange between European countries has been made by a German-British agreement under which Britain can sell cars in Western Germany during 1953 up to a fixed value, and Western Germany can export a certain dollar value to Britain. German cars expected to find a sale in England are Mercedes-Benz, Volkswagen, Porsche, and Borgward.

A similar agreement is expected to be signed shortly between England and France. At the present time, Citroen and Renault assemble in England but are under the same obligations as British firms to export a percentage of their production.

## CHEAPER FARMING

Fiat introduced this new farm tractor and a track laying model recently, powered by its new 25 hp four-cyl Diesel engine.



## Fairchild is Awarded Additional Contracts

Six million dollars in new Government business covering jet engines for guided missile application and internal combustion accessory powerplants for long-range bombers were recently announced by Fairchild Engine and Airplane Corp.

An Air Force contract for additional V-32 auxiliary powerplants comprises roughly half of the dollar volume involved in the new production. The balance of funds are for increased manufacture of Fairchild's J-44 turbojet, in accordance with a letter of intent from the Navy Bureau of Aeronautics.

## GM Donates \$100,000 for Tornado Victims

General Motors Corp. demonstrated its public service policy recently by making a substantial contribution for the relief of victims in the tornado which smashed a large area at Flint, Mich., where large Buick, Chevrolet, Fisher Body, and A. C. Spark Plug operations are concentrated.

A day after the tornado struck, GM made \$100,000 available for relief. A couple of days later the UAW-CIO announced a matching

sum, \$50,000 from the International Union and the balance from locals within the state.

GM's Flint plants escaped the destruction, and operations continued unhampered, except for one Chevrolet manufacturing plant, which was closed for a short period because of a power line failure resulting from the storm. The company has about 68,000 employees in the Flint area.

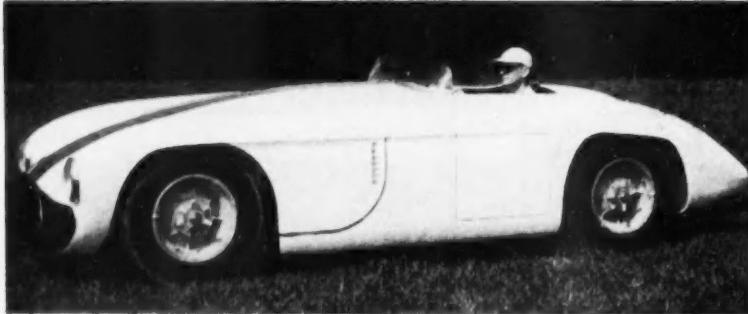
## Micromatic Hone Buys Demco of Chicago

Micromatic Hone Corp. has acquired all assets of Diesel Engineering and Manufacturing Corp. (Demco), manufacturer of equipment for production of high-precision parts on a mass-production basis. Name of the company subsidiary will be changed to Micro-Precision, Inc.

Demco has developed techniques for manufacturing Diesel fuel injection systems and jet engine fuel flow controls on a high-production basis at tolerances down to millionths of an inch. It also produces tailor-made hydraulic components for jet aircraft.

The acquisition was accomplished by a straight exchange of 14,428 shares of Micromatic stock for the entire Demco equity on the basis of book value.

# News of the AUTOMOTIVE



## RIGID AXLE RACER

B. S. Cunningham's latest road racing bid returns to non-independent front and rear suspension. The underslung chassis is sprung by torsion bars. Drive line consists of a 310-hp Chrysler engine, Borg & Beck clutch, modified Stata four-speed constant mesh transmission. Alfin type 17 in. diam air-cooled brakes are used with 16 in. magnesium wheels. The 100 in. wheelbase car weighs 2590 lb empty. Equipment includes four Zenith carburetors, Auto-Lite ignition, mechanical and electrical fuel pumps and aircraft type air cooler for what is deemed to be top operating efficiency.

## Plymouth Puts Hy-Drive on Fourth of Output

Plymouth currently is equipping between 20 and 25 per cent of its cars with its Hy-Drive semi-automatic transmission. Hy-Drive installations now are at the rate of 3300 a week.

The unit is produced in a new department set up at the main Detroit plant where the torque converter housing is machined and the converter assembled. According to reports, 20 modifications in the engine chassis and body were required to fit the new drive to production cars.

## Car Cooler Service Hampered by Rules

Every advance in automobile development appears to be accompanied by new problems. Air conditioning apparently is no exception.

One of the problems facing the industry is the number of different local ordinances and regulations affecting installation and service of air conditioning units, including those installed in automobiles. Since freon refrigerant used in such systems may produce a toxic gas under certain conditions of heat, service men dealing with it are often required to be licensed.

A second problem is that the fear

of competition from mechanics licensed to service air conditioning units has alarmed certain union groups in the air conditioning field who would like to see the automobile men limited to working only on air conditioning of cars. However, due to the growing popularity of air conditioning for cars, the industry is confident that the service problem can be worked out with the various licensing bodies.

## Lincoln Publishes Arc Welding Data

The Lincoln Electric Co. recently published information on its system of WelDesign, which is said to be a new approach to making better machinery at lower cost through the intelligent application of the arc welding process.

Material now available for self-study consists of: a large WelDesign manual of factual data to guide engineers in the field of welded design; supplementary notes; cost calculator slide rule; moment of inertia rule; set of weld standards on onion skin for duplication; and copy of 1300-page "Procedure Handbook of Arc Welding Design and Practice." Price is \$10, postpaid in U. S., \$12 elsewhere. Address: Lincoln Electric Co., Cleveland 17, O.

## Standard Pressed Steel Buys Cooper Products

Cooper Precision Products, a Los Angeles manufacturer of hex-head bolts for the aircraft industry, has become a wholly owned subsidiary of Standard Pressed Steel Co. The arrangement will permit SPS to diversify further its products and give it manufacturing facilities in the heart of the Pacific Coast aircraft industry.

Both companies will continue to operate independently. Each will retain its own sales organization, and no changes in management policy are planned at the time.

## Continental Reduces Some Engine Prices

The Air Cooled Industrial Engine Div. of Continental Motors Corp. has announced price reductions ranging from 10 to 16 per cent, effective July 1. The cuts apply to heavy duty four-cycle air-cooled engines used on lawn mowers, garden tractors, and similar applications.

## AMA Marks 40th Year, Honors C. E. Wilson

The Automobile Manufacturers Association marked its 40th anniversary at its annual meeting in Detroit recently. George W. Mason, president, pointed out that when the association was founded as the Automobile Chamber of Commerce in 1913, it included 73 different makes of passenger cars and 20 trucks, with more than 12 of the cars electrics. In that year the industry turned out 485,000 cars and trucks, equivalent to about three weeks of good production at present rates.

At a special ceremony, Secretary of Defense C. E. Wilson, former president of General Motors Corp., was honored with an engraved scroll citing his contributions to the automobile industry and the nation during World War II and his leadership during the postwar years. Mr. Mason was elected president of AMA for his seventh consecutive year. All other officers and directors were reelected.

# AND AVIATION INDUSTRIES

## Fisher Tank Order Increased Again

Fisher Body Div. of General Motors Corp. received the major part of the \$231.5 million in defense contracts awarded to Michigan industry in May. The Fisher order for medium tanks totaled \$217.2 million.

Other contracts included: Chevrolet, \$3.47 million for cars and trucks; GMC Truck and Coach, \$202,222 for 10-ton trucks; Chrysler, \$307,395 for tank parts; Ford, \$212,641 for 2½ ton commercial type trucks, Motor Wheel Corp., an additional order of \$918,748 for production of shells for the Armed Forces.

## GM Head Urges Tax Extension

Harlow H. Curtice, president of General Motors Corp., recently came out strongly in favor of continuing the excess profits tax until the end of this year, as recommended by President Eisenhower.

Despite opposition to the measure from other prominent business leaders, Mr. Curtice said the President's program should be carried out, although GM would stand to suffer most heavily under the excess profits tax. It is estimated that continuation of the tax for the rest of this year would cost GM more than \$100 million.

## Beech, Canadair Orders for Trainers Cancelled

Cutbacks affecting plane deliveries to the Air Force call for cancellation of orders for 420 T-36 trainers, which were to have been produced by Beech Aircraft Corp., Wichita, Kan., and Canadair, Ltd., of Montreal.

Beech had contracted to build 193 of the piston-engine planes, which were intended to meet specialized training requirements. The firm will complete two T-36s as prototypes for test purposes.

According to the Air Force, the T-36 contracts are being dropped because it is believed the requirements for which the trainer was designed can be handled by other aircraft.

## Ford Offers Power Steering Unit on V-8 Cars; GM, Chrysler, Nash, Studebaker Ready Others

Ford has adopted power steering as an optional equipment item on V-8 passenger cars only. The linkage booster type unit is supplied by Bendix and has a suggested list price of \$125, plus dealer charges, which brings the price to the customer to about \$134.

A 3½ lb pull on the steering wheel is required before power steering takes over at cruising speeds. Ford has named its power steering unit "Master-Guide."

General Motors Corp.'s first new linkage type power steering unit is expected to appear shortly, probably on Hudson. At the recent SAE meeting in Atlantic City, N. J., a GM official stated that prices on power steering appear to be coming down, and a reduction of from 10 to 15 per cent on next year's models is indicated.

Chrysler is tooling its Trenton, Mich., engine plant for production of its own power steering unit, which is

said to be considerably simplified from the one it now uses. It will, however, be an integral unit and, contrary to some reports, will retain the "full time" principle. The plant will not be ready to supply the company's entire needs for some time, however, and Dodge and Plymouth are expected to use a linkage type power assist steering from outside suppliers on next year's models.

Nash is reportedly planning to offer power steering on its Statesman models in the near future. The unit will be supplied by Monroe Auto Equipment Co. Nash currently offers a Bendix power steering unit on the Ambassador.

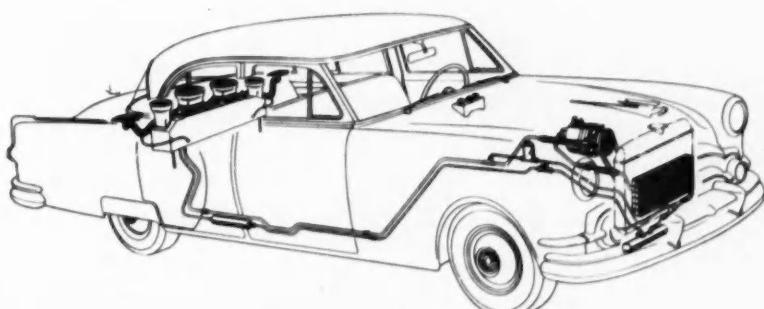
It is reported that Studebaker soon will offer hydraulic power steering. The company early this year announced a mechanical power steering unit, but for some reason did not supply many of them to the field. It is understood that the hydraulic unit will be supplied by GM.

## Tank Range Finders Made at Northrop-Anaheim Div.

New optical range finders and ballistic computers for Patton 48 tanks are now in production at Northrop Aircraft's Anaheim Div.

The devices are being built under Ordnance Corps' contracts totaling nearly \$29 million.

The announcement followed closely two recent disclosures that Northrop's Anaheim installation has been awarded other contracts for production of telescopes, periscopes, and telescope mounts. All are used for sighting and aiming on 105-mm howitzers.



**COOLER PACKARDS NOW**

*For the first time since 1939, air conditioning is now available as a factory installed unit.*

# News of the AUTOMOTIVE

## Westinghouse to Swap Data with Rolls-Royce

Westinghouse Electric Corp. and Rolls Royce, Ltd., of England have entered into a ten-year agreement to exchange information on gas turbine aircraft engines.

The agreement, which is contingent upon approval by the U. S. and British governments, also provides for an exchange of personnel. Payment of an initial capital sum to Rolls Royce by Westinghouse was announced, but no details as to amount or reason for the payment were divulged.

## Ford Buffalo Plant Steps Up Schedule

It is reported that the Buffalo assembly plant of Ford Motor Co. has resumed production on a prolonged overtime production schedule. The plant will allegedly operate nine hours a day, six days a week through the summer to make up the production lost since it was forced to halt production May 21.

## Plymouth Contest

The seventh international model plane contest, Plymouth Motor Corp.'s annual event, will again bring 500 youngsters to Detroit, winners from among 35,000 entered in regional contests.

More than 125 trophies and defense bonds totaling over \$4,000 will be

given, in addition to all expenses for the finalists. The meet will inaugurate competitive events for radio-controlled models.

## Key Helicopter Patents Bought by Rotor-Craft

Rotor-Craft Corp. has completed outright purchase of all U. S. and foreign patents of Landgraf Helicopter Co. In so doing it has gained control of basic patents applying to so-called "rigid rotor" helicopters.

Landgraf patents acquired cover automatic pitch control mechanisms, controllable blade ailerons, a method for transmitting power from an engine to rotor hubs without use of a driveshaft, and an over-all control system. No disclosure has been made of the purchase price of the patents.

## Auto Industry Pays 20 Per Cent of Tax

According to testimony at hearings before the House Ways and Means Committee, the automobile industry pays about 20 per cent of the excess profits taxes levied by the Government.

Data on such taxes paid in 1950 show that the industry, including manufacturers of trucks, trailers, parts, and other vital components such as truck bodies, paid \$251.5 million of the \$1.3 billion collected in excess profits taxes that year.

## SPEEDY

*Solar Aircraft Co.'s planetary geared roll-welder makes three-in.-diam circular seam-welds to attach the afterburner fuel manifold on a J47 jet engine exhaust cone assembly. The \$14,000 welding machine replaces seven spotwelders. It cut cycle time for the welding operation from four hr to 45 min. Seamwelder head, the upper electrode moves while the work remains stationary. Lower electrode is an air-operated clamping fixture.*



## Yale Show Commences Second Leg of Trip

The Yale Materials Handling Road Show recently started on the second leg of its two-year transcontinental tour demonstrating labor-saving, time-and-money-saving equipment to business and industry.

First stop on the second leg was the Canadian International Trade Fair at Toronto, where it played from June 1 to 12. It is now on the road in a series of one, two and three-day stands, primarily in the Middle West.

## Viscosity Standard Changed by NBS

On July 1, 1953, the National Bureau of Standards will adopt the value of 0.01002 poise for the absolute viscosity of water at 20 C as the primary standard for the calibration of standard viscosity samples and viscometers.

Up to the present time the value of 0.01005 poise for the absolute viscosity of water has been used widely as the primary reference standard. It is said that the use of the new value of 0.01002 will result in a reduction of 0.3 per cent in the measured values of viscosity and will make viscosities reported in absolute units correspondingly more accurate.

## Chevrolet Passes 29 Million Mark

Chevrolet on June 9 completed its 29 millionth vehicle. If that pace continues for the rest of this year, the division would very nearly equal its all-time record of 2,035,158 cars and trucks established in 1950 to break the industry record held by Ford since 1923.

An interesting fact, however, is that Ford still holds the record for the largest production of passenger cars in any one year by a rather substantial margin. In 1928, Ford built 1,817,891 passenger cars, compared with Chevrolet's 1,520,583 cars in 1950. Chevrolet's truck production of 494,575 units, however, ran the combined vehicle total to the highest on record for any one company.

# AND AVIATION INDUSTRIES

## Jaguars Take Le Mans

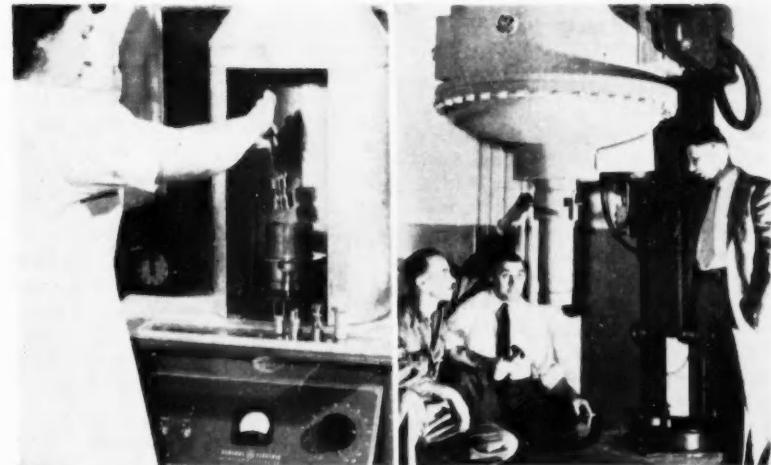
With a total distance of 2540.24 miles, averaging 105.84 mph, a Jaguar driven by Rolt and Hamilton won the annual 24-hr road race at Le Mans, France, breaking all records. A similar Jaguar came in second, while Walters and Fitch, driving a Chrysler-powered Cunningham, secured third place with a distance of 2498.16 miles.

The full team of Jaguar cars finished the race with first, second, fourth and ninth positions. The Cunninghams also went through without losing a car, the positions being third, seventh and tenth. These were the only teams to finish complete among the starters in a very devastating race leaving only 25 of the original 60 entries running at the finish. Fastest lap was set up by Ascari with a 12-cyl Ferrari, at an average of 112.86 mph, and the fastest flying kilometer was by Walters with the Cunningham at 145.14 mph.

## Plymouth Marks 25th Anniversary Quietly

Plymouth celebrated its 25th anniversary on June 15 with little of the fanfare that is attending the birthday jubilees of some of its competitors. Nonetheless, the company's growth has been as rapid as that of any major producer in the industry since the first Plymouth car came off the production line June 14, 1928.

Within three years Plymouth had moved into third place in production



## TO CLEAN AND INSPECT

*Two relatively new tools for production are ultrasonic cleaning and x-ray inspection machines. Holley Carburetor Co. cleans jet engine fuel control parts, left, with a General Electric ultrasonic generator, reporting significant improvement in efficiency and speed over the former hand scrubbing method. Eaton Mfg. Co. can radiograph several hundred sodium-cooled aircraft valves at once, right, with the GE one million volt machine. The beam emanates throughout a 360 deg circle around the target of the x-ray tube. Transmitted beam can be used with reflected beam to inspect such objects as castings for any possible flaws that may be present.*

and sales and has maintained that position ever since. In the 25 years the company has been in business it has turned out over 7,850,000 cars.

The early years of the company were marked by bold and vigorous action, such as the decision to build a large modern assembly plant at Detroit despite the stock market crash in 1929, a \$9 million investment in new tooling at the Plymouth plant,

and opening of a new assembly plant at Los Angeles in 1932.

Another radical departure in industry practice was the decision to distribute the Plymouth through Chrysler, DeSoto and Dodge dealers, a system which has never been abandoned. At present Plymouth operates four assembly plants at Detroit, Evansville, Ind., and San Leandro and Los Angeles, Calif.

## REGIONAL SALES OF NEW PASSENGER CARS

Zone	Region	April 1953	March 1953	April 1952	1953	1952	Four Months			Per Cent Change		
							March	April	1953	1952	March	April 1952
1	New England	33,332	28,564	24,049	102,747	74,604	+16.69	+38.60	+37.72			
2	Middle Atlantic	97,107	94,066	76,005	332,025	239,876	+3.23	+27.78	+38.42			
3	South Atlantic	54,107	57,334	42,097	204,889	158,593	-4.22	+30.45	+29.19			
4	East North Central	138,973	131,308	97,799	468,066	338,135	+3.55	+39.03	+38.43			
5	East South Central	25,224	22,988	16,751	87,677	61,299	+9.73	+60.58	+43.03			
6	West North Central	64,115	43,564	37,245	176,654	129,457	+47.17	+72.14	+36.46			
7	West South Central	40,429	41,064	30,808	164,990	117,160	-1.59	+31.23	+40.82			
8	Mountain	19,235	16,287	13,831	61,130	43,307	+18.10	+39.07	+41.16			
9	Pacific	57,952	51,173	35,703	199,247	131,572	+13.25	+62.32	+51.44			
Total—United States		526,278	486,368	374,288	1,797,425	1,294,003	+8.62	+41.14	+38.90			

States comprising the various regions are—Zone 1: Conn., Me., Mass., N. H., R. I., Vt.—Zone 2: N. J., N. Y., Pa.—Zone 3: Del., D. C., Fla., Ga., Md., N. C., S. C.—Zone 4: Ill., Ind., Mich., Ohio, Wis.—Zone 5: Ala., Ky., Miss., Tenn.—Zone 6: Iowa, Kan., Minn., Mo., N. D., S. D.—Zone 7: Ark., La., Okla., Tex.—Zone 8: Ariz., Colo., Idaho, Mont., Nev., N. M., Utah, Wyo.—Zone 9: Cal., Ore., Wash., Va., W. Va.—Zone 10: N. Dak., S. Dak., Mont., Wyo.

# News of the AUTOMOTIVE

## Atomic Energy Starts Ford Rotunda Lights

Indicative of the minute detail to which Ford has gone in its 50th Anniversary celebration is the method used to activate lighting at the opening of the Ford Rotunda June 16 after extensive remodeling. The lights were turned on through use of a radioactive wand acting upon a Geiger tube linked to a special counting device.

The Geiger counter was adjusted to make electrical contact after registering 44,890,832 gamma ray impulses representing the exact number of vehicles built by Ford since the company was established June 16, 1903.

The completely refurbished Rotunda, which has been under remodeling for more than a year, again is open to the public with entirely new exhibits and decorative murals.

## GM Motorama Viewed by 1.7 Million

General Motors Corp. has rung down the curtain on its 1953 Motorama after showing it to more than 1.7 million visitors in six major cities. The six months tour, which was an extension of the GM Waldorf Show in New York, was seen in Miami, Los

Angeles, San Francisco, Dallas and Kansas City, Mo. It is understood that GM is highly pleased with the reception of the Motorama and that it likely will go on the road again next year.

## Reo Sets Up Military Engineering Group

Reo Motors, Inc., has established a military engineering department for research and development of advanced types of wheeled vehicles. W. A. Jensen, ass't chief engineer, will head up the new department.

## Military Research May Be Cut Back

Industrial research programs of the Army, Navy, and Air Force may be headed for a 25 per cent budget cut, if Defense Secretary Wilson decides to go ahead with tentative plans for trimming all but the most essential type of Government-backed scientific studies.

Mr. Wilson has ordered each of the three military services to submit detailed lists of projects now under way. It is hinted that only the most "fruitful" projects are to receive official clearance in the future.

## Buick Passes Milestone With Seven Million Cars

Buick on June 8 marked completion of its seven millionth car since the company was organized 50 years ago. The last one million cars were produced in 2½ years to bring Buick's postwar production to 2,618,567 units. Current production of 600,000 units annually is at the highest pace in history.

## Drop Floor Planned for 1954 Model

It is reported that at least one additional car manufacturer will adopt a recessed floor in its 1954 models to lower overall height. It is understood that the problem of additional tunnel height in the front compartment will be met by a unique suspension for the automatic transmission.

## DTA Lists Vehicle Needs in Total War

The Defense Transport Administration has submitted to NPA its recommendations covering automobile and truck production in the event of total war. It proposes that passenger car lines would continue to operate until supply lines are empty. In addition, some capacity would be held intact for production of probably 300,000 units a year for needs of essential users, such as doctors.

DTA estimates that about one million units would be turned out before the industry would shut down completely and that an additional 500,000 would be in dealer stocks at that time. The recommendations also include keeping production facilities operating for about 380,000 trucks and 40,000 trailers a year for domestic use.

## Scintilla Starts New Plant at Sidney, N. Y.

Scintilla Magneto Div. of Bendix Aviation Corp. has started its fifth plant expansion since the beginning of the Korean war. The new plant at Sidney, N. Y., will have 8500 sq ft of floor space and is scheduled to be completed shortly.

## 1953 NEW TRUCK REGISTRATIONS\*

Arranged by Makes in Descending Order According to the 1953 Four Months' Totals

MAKE	April	March	April	FOUR MONTHS		Units	Per Cent of Total
				1953	1952		
Chevrolet	33,103	30,490	24,391	113,584	83,912	36,39	32.80
Ford	22,936	18,728	17,886	72,928	58,112	23,37	23.11
International	10,011	9,762	8,277	35,195	29,207	11,28	11.42
Dodge	8,894	8,546	8,188	32,631	30,749	10,46	12.02
G. M. C.	8,485	7,711	7,025	29,782	25,189	9,54	9.85
Studebaker	2,824	2,413	2,534	9,282	8,031	2,97	3.53
White	1,225	1,215	1,115	4,055	3,782	1,30	1.47
Willys Truck	884	911	909	3,589	3,342	1,15	1.35
Willys Jeep	792	742	718	2,206	2,519	1,03	.98
Mack	710	661	785	2,251	2,381	.72	.63
Reo	396	346	265	1,288	1,012	.41	.40
Diamond T	314	292	349	1,080	1,274	.35	.30
Dixie	201	197	256	718	1,052	.23	.21
Bruckway	168	189	153	680	551	.22	.22
Autocar	168	162	147	561	556	.18	.22
Federal	81	69	98	333	285	.11	.11
Kenworth	94	65	71	261	250	.08	.10
Pontiac	36	38	41	147	214	.05	.06
F. W. D.	18	27	40	120	194	.04	.06
Peterbilt	25	10	23	60	78	.02	.03
Misc. Domestic	61	64	222	229	874	.07	.04
Misc. Foreign	20	34	71	102	127	.03	.05
Total - All Makes	91,127	79,672	73,461	312,021	255,771	100.00	100.00

\* Based on data from R. L. Polk & Co.

# AND AVIATION INDUSTRIES

## Caterpillar Tractor Planning New Plant

Caterpillar Tractor Co. will build a new 700,000 sq ft plant at a location not yet determined. The new unit will be used for production of motor graders and industrial wheel tractors and will release space at Peoria, Ill., for expanded production of crawler tractors and Diesel engines.

Construction of the new plant and expansion and rearrangement of current manufacturing facilities are scheduled for completion by the end of 1955 at a total cost of about \$45 million for new machinery, equipment, land, and buildings.

## All Advertiser Wins Award in Competition

The Ohio Seamless Tube Company was recently presented with the Honorable Mention Award in the 1953 Creative competition of the National Advertising Agency Network for industrial advertising which appeared in the pages of AUTOMOTIVE INDUSTRIES. Award certificates and confirming documents were presented to representatives of the Howard Swink Advertising Agency, Inc., of Marion, O., agency for the company.

## Chrysler, Plymouth Win Belgian Race Honors

Chrysler and Plymouth automobiles won victories in their classes in both speed and fuel economy in the 1953 Francorchamps standard stock car race over the difficult Belgian course.

The winning Chrysler New Yorker sedan with power steering attained a speed of 126.1 mph at one point on the rugged course laid out over a circuit of 8.82 miles with many loops and bends through the Ardennes mountains.

A standard stock car Chrysler with 180 hp V-8 engine won the fuel economy contest in its class with an average of 20.08 mpg. It averaged 89.43 mph to win the speed contest also in its class, and it ran the fastest lap over the hilly course with an average of 91.55 mph.

## 1953 RETAIL CAR SALES BY PRICE GROUPS\*

Price Group	April		NUMBER OF CARS		Four Months	
	1953	1952	1953	% of Total	1953	% of Total
Under \$2,000	282,690	53.81	198,083	53.25	691,108	53.70
\$2,001 to \$2,500	148,465	28.26	106,852	28.73	500,951	28.05
\$2,501 to \$3,500	72,469	13.80	50,461	13.57	250,037	14.00
Over \$3,500	21,677	4.13	16,539	4.45	75,977	4.25
Total .....	525,301	100.00	371,935	100.00	1,786,073	100.00
					1,285,719	100.00

## DOLLAR VOLUME OF SALES

Price Group	April		NUMBER OF CARS		Four Months	
	1953	1952	1953	% of Total	1953	% of Total
Under \$2,000	\$503,999,525	45.26	\$351,777,283	44.75	\$1,721,061,173	45.09
\$2,001 to \$2,500	330,111,573	29.64	237,214,206	30.17	1,121,014,157	29.37
\$2,501 to \$3,500	198,999,862	17.87	136,299,849	17.34	686,277,537	17.98
Over \$3,500	60,465,862	7.23	40,881,840	7.74	288,647,173	7.56
Total .....	\$1,113,576,822	100.00	\$786,173,178	100.00	\$3,817,000,040	100.00
					\$2,682,894,125	100.00

\* Calculated on basis of new car registrations, as reported by R. L. Polk & Co., in conjunction with advertised delivered price at factory of four door sedan or equivalent model. Does not include transportation charges or extra equipment.

† New registrations of American made cars only. Does not include imported foreign cars.

Winners in the annual Francorchamps race are decided on the basis of fuel economy and speed. The race is unique in that the drivers compete to see which one can cover the greatest distance over the course of 8.82 miles in two hours of driving time.

The winning Plymouth was a stock car four-door sedan with a 100-hp engine and overdrive. It won the fuel economy test in its class with an average of 25.32 mpg. The car also won the speed test in its class by averaging 81.25 mph during the two-hour contest.

## 1953 NEW PASSENGER CAR REGISTRATIONS\*

Arranged by Makes in Descending Order According to the 1953 Four Months' Totals

MAKE	APRIL		MARCH		APRIL		APRIL		MAY		JUNE		FOUR MONTHS		
	1953	1952	1953	1952	1953	1952	1953	1952	1953	1952	1953	1952	1953	1952	
Chevrolet	126,378	116,766	75,685	402,928	274,051	22,42	21,19								
Ford	85,273	81,076	73,311	312,888	216,165	17,41	16,71								
Plymouth	53,920	47,768	37,417	189,825	143,130	10,57	11,06								
Buick	43,465	41,422	28,424	145,669	99,955	8,10	7,72								
Pontiac	38,549	33,210	22,284	122,707	80,939	6,83	6,25								
Oldsmobile	30,278	28,751	19,918	101,549	70,058	5,65	5,41								
Dodge	30,524	25,717	20,776	96,483	72,010	5,48	5,56								
Mercury	21,250	21,557	16,478	80,383	54,737	4,47	4,23								
Nash	16,077	16,005	17,153	57,433	40,009	3,20	3,09								
Chrysler	15,099	13,600	10,455	51,477	38,182	2,86	2,95								
Studebaker	18,614	11,822	13,819	47,654	57,798	2,65	4,47								
De Soto	11,496	10,082	8,580	39,258	29,466	2,18	2,28								
Cadillac	9,710	9,940	7,661	36,411	25,414	2,03	1,96								
Packard	8,057	7,943	6,418	29,104	20,857	1,62	1,61								
Hudson	7,491	6,160	6,781	23,667	23,798	1,32	1,84								
Villiers	4,918	1,075	2,888	18,892	9,424	1,05	1,73								
Lincoln	4,011	2,510	2,656	11,957	6,861	67	53								
Kaiser	2,731	2,659	3,417	10,222	11,976	57	93								
Henry J	1,201	1,280	2,389	4,827	9,016	.27	.70								
MG (British)	638	682	538	2,516	1,713	14	13								
Ford (British)	390	400	294	1,658	1,146	.09	.09								
Hillman (British)	448	408	387	1,653	1,264	.09	.10								
Jaguar (British)	402	386	256	1,436	826	.06	.06								
Austin (British)	353	362	402	1,363	1,570	.08	.12								
Allstate	55	71	107	264	389	.01	.03								
Misc. Domestic	282	179	462	745	1,934	.04	.15								
Misc. Foreign	608	537	339	2,236	1,282	.12	.10								
Total All Makes	528,278	486,368	374,288	1,707,425	1,294,003	100.00	100.00								

\* Based on data from R. L. Polk & Co.

# Men in the News



**Reo Motors, Inc.** —  
**Henry H. Durr** was  
named engine develop-  
ment engineer.



**Dodge Div., Chrysler**  
**Corp.** —**Byron S. Snow-  
den** is now merchandis-  
ing manager — trucks.



**Galion Allsteel Body**  
**Co.** —**W. A. Herpich**  
was promoted to man-  
ager of manufacturing.



**Libbey - Owens-Ford**  
**Glass Co.** —**E. Davis**  
**Caldwell** is a special  
representative on plas-  
tics to the industry, in  
Detroit.



**Eaton Mfg. Co.** —  
**W. A. Paterson** is now  
general sales manager  
of the Heater Div.,  
with offices in Detroit.



**Ohio Crankshaft Co.** —  
**W. E. Benninghoff**,  
general manager of  
the Tocco Div., was  
elected vice-president  
of the company.

**Minn. Mining & Mfg. Co.** —**Dr. H. H. Stephens** was elected vice-president in charge of central research. **Dr. Matthew W. Miller** was raised to business manager and Drs. **Alvin M. Borders** and **Harold M. Scholberg** to associate directors.

**Bakelite Co. Div. of UCC Corp.** —**George C. Miller** was named president of the company. **C. W. Blount** succeeds him as vice-president in charge of sales, and **H. K. Intemann** is vice-president and general sales manager.

**Amplex Div., Chrysler Corp.** — Election of **Douglas B. Martin** as vice-president in charge of sales was announced recently. **Karl H. Kuhlen** was named sales manager.

**Trailmobile, Inc.** — Appointments of **Harry Eyler** as vice-president of sales and **James J. Black** as vice-president of engineering have been announced. **Charles P. Reynolds** is now comptroller.

**Mercast Corp.** — **S. J. Sindeband**, president of Mercast licensee Alloy Precision Castings Co., was elected president.

**Seiberling Rubber Co.** — **W. H. Oburn**, assistant treasurer, has retired after 31 years service. Appointment of **James K. MacDougall** as director of industrial relations has been announced.

**Link-Belt Co.** — **Harvey V. Eastling** is now assistant general manager of the Pacific Div. **Donald E. Thal** was named sales manager of the San Francisco plant.

**American Chain & Cable Co.** — **Wilmet F. Wheeler, Jr.** is now assistant to the president.

**Garrett Corp.** — **T. G. Hawkins** was elected treasurer.

**Hufford Machine Works, Inc.** — **Harry P. Smith, Jr.** has been named executive vice-president and general manager; **Walter G. Wheeler**, vice-president of engineering and production; **N. T. Harty**, secretary-treasurer; and **A. R. Collins**, controller and assistant secretary-treasurer.



**Imperial Brass Mfg. Co.** — **Thomas A. Byrnes** fills the newly-created position of sales manager—eastern division, and **Gordon J. Duerr** is the new sales manager—western and mid-western division.

**Lincoln-Mercury Div., Ford Motor Co.** — **Robert B. Humphrey** has been made assistant plant manager of the Wayne, Mich., plant and **Joseph N. Locatell** assistant plant manager of the Metuchen, N. J. plant. **J. Emmet Judge** is now assistant general purchasing agent.

**Electric Auto-Lite Co., Spark Plug Div.** — **L. B. O'Loughlin** has been appointed sales manager.

**Bendix Computer Div., Bendix Aviation Corp.** — **James V. Williams, Jr.** was chosen supervisor of engineering.

**Ethyl Antiknock, Ltd.** — **Howard J. Philp** has been promoted to assistant manager.

**Eclipse-Pioneer Div., Bendix Aviation Corp.** — **E. J. Petterson, C. E. Rowett, J. B. Treacy, and H. R. Doughty** have been named assistant sales managers.

**Anderson Bros. Mfg. Co.** — **Walter E. Gunnerson** has been elected vice-president in charge of sales.

**Lockheed Aircraft Corp., Georgia Div.** — **P. H. Bremer** has been made structural engineer and **Carl F. Friend** is now aerodynamics engineer.

**Fedders-Quigan Corp., Automotive Div.** — **W. W. Reeves** is now sales manager.

**Illinois Tool Works**  
—Edwin W. Shipman has been elected vice-president and manager of the licensee division. J. R. Russell was raised to secretary.



**American Brakeblok Div.**—M. B. Terry was named president, to succeed W. T. Kelly, Jr., who continues as president of the Kellogg Div. and vice-president of American Brake Shoe Co.



**Allied Products Corp.**—John F. Haller was elected vice-president in charge of engineering. Eugene F. Wambold was named vice-president and general manager of the Michigan Powdered Metal Products Co., a subsidiary.



**Acushnet Process Co.**—Karl P. Goodwin is now 2nd vice-president and director of sales of the rubber division.



**Aluminum Industries, Inc.**—Randolph J. Rossert was elected vice-president.



**Warner Electric Brake & Clutch Co.**—King DeSeve has been promoted to manager of manufacturing operations.

**Hiller Helicopters**—William C. Jordan has joined the company as executive vice-president and general manager.

**Elwell-Parker Electric Co.**—Lee C. Hopper has been appointed advertising manager.

**Vard, Inc.**—Phillip R. Heim has been elected to the board of directors and appointed vice-president in charge of manufacturing.

**Republic Steel Corp.**—Norman W. Foy has been elected vice-president in charge of sales, succeeding J. M. Schlendorf, while L. S. Hamaker has been made general manager of sales. S. A. Crabtree and R. W. Helms are assistant general managers of sales.

**Raybestos-Manhattan, Inc.**—S. R. Zimmerman, Jr. has been elected to the board of directors.

**Oakite Products, Inc.**—H. Liggett Gray was elected second vice-president; Frank L. Oldroyd, Eustace Lingle, and Van Dorn C. Smith, vice-presidents; and George M. Seib, secretary.

**Westinghouse Electric Corp., Aviation Gas Turbine Div.**—Hewett R. Arnold has been made assistant division manager; Thomas A. Daly, manager of technical operations; Joseph F. Chalupa, manager of manufacturing for South Philadelphia plant; James W. Fatkin, assistant to the division manager; and Vincent J. Gordon, Jr., assistant manager of production.

**Thermoid Co., Friction Div.**—A. K. Runkle has been made superintendent.

**International Nickel Co. of Canada, Ltd.**—J. Roy Gordon has been elected vice-president and general manager of Canadian operations.

**Fruehauf Trailer Co.**—A. E. Williams has been elected vice-president in charge of engineering, and R. L. Baxter, truck bodies and special equipment sales manager.

**Republic Rubber Div., Lee Rubber and Tire Corp.**—Carl H. Zieme retired recently.

**Consolidated Vultee Aircraft Corp.**—P. M. Prophett has been appointed manager of F-102 delta-wing interceptor flight test operations. W. B. Harwell is now manager of production flight for the San Diego Div.

**Rosan, Inc.**—S. T. Williams has been named works manager.

**Rotor-Craft Corp.**—Dr. Paul B. MacCready, Jr. has joined the research staff.



**American Chain & Cable Co.**—Henry Ervin was elected vice-president-director of sales of the parent and associate companies. Harry Williams, sales manager of the Automotive and Aircraft Div., has also been elected a vice-president.

**Motor Products Corp., Automotive Div.**—Berton E. Rogers has been named vice-president in charge of manufacturing.

**Dow Chemical Co.**—Dr. William R. Veazey has retired after 37 years service, including 26 as a board member. Herbert D. Doan and Herbert H. Dow II were elected to the board. Three new vice-presidents are Dr. Ray H. Boundy, director of research; Donald Williams, director of sales; and Dr. J. D. Hanawalt, manager of the magnesium department.

### Necrology

**Harlan Ellis**, 47, manager of direct sales, Lockheed Aircraft Corp., died recently at his office.

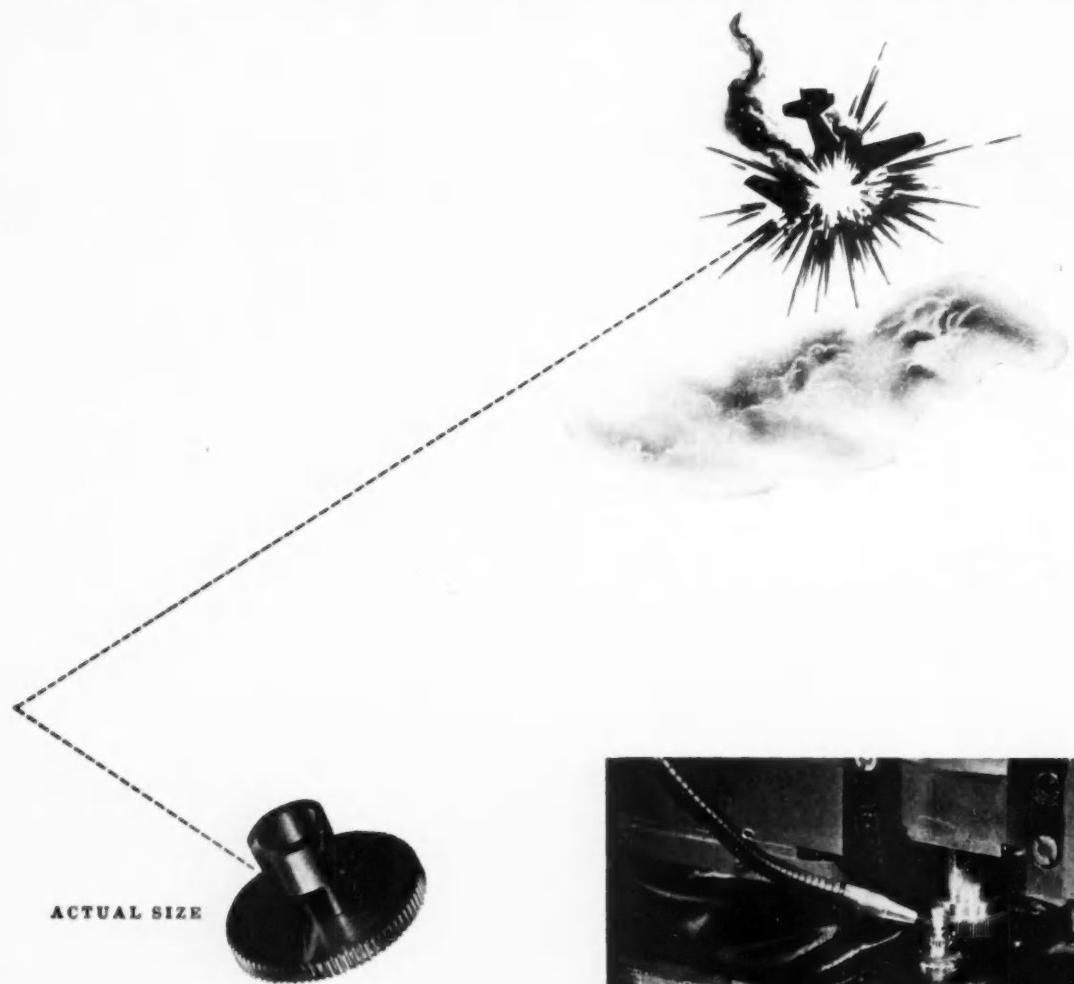
**Sumner Simpson**, 79, board chairman of Raybestos-Manhattan, Inc., died at Bridgeport, Conn., on June 13.

**Stephen P. Foster**, 65, former economist for Norton Co., died at Worcester, Mass., on May 26.

**George C. Montague**, 86, Norton Company's first grinding machine salesman, died at Worcester, Mass., recently.

**R. Leslie Beattie**, 62, vice-president and general manager of Canadian operations of The International Nickel Co. of Canada, Ltd., died at Toronto, Ont., on June 10.

# *Direct Hits* take Fellows-Cut



ACTUAL SIZE



## SPECIFICATIONS

Material.....	Corrosion Resistant Steel 416
Outside Diameter .....	1.2812 + .000 — .001
Pitch Diameter .....	1.2500 + .0000 — .0005
Concentricity T.I.R. ....	.0004"
Diametral Pitch .....	64
Pressure Angle .....	14½°
Number of Teeth.....	80
Face Width .....	3/16"



FELLOWS CUT...by nine 3" Gear Shapers

*Fellows*

The FELLOWS METHOD  
...in action!

# Instrument Gears by the TON

A typical one of Arma Corporation's automatic aiming mechanisms has some 3,500 gears working in combination. These gears deliver motion only. Excessive pitch line run-out must be avoided or hits become misses.

## a fair question

What is the quickest and most economical way to mass produce this accuracy?

Arma has picked the Fellows Method time and time again. Here are 4 reasons why:

**Accuracy**—scores of manufacturers in their own field could readily testify to mass production within unusually close tolerances with Fellows equipment.

**Speed**—a typical gear, specified at left, was cut, shaved and inspected in 4 minutes, 40 seconds.

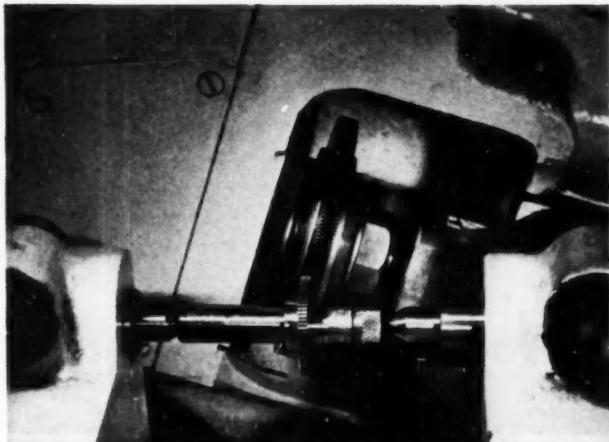
**Versatility**—the Fellows 3" Gear Shaper cuts gears from 1/16 inch pitch diameter to 3 inch pitch diameter.

**Economy**—one man runs 3 machines. Easily accessible fixtures cut change-over time.

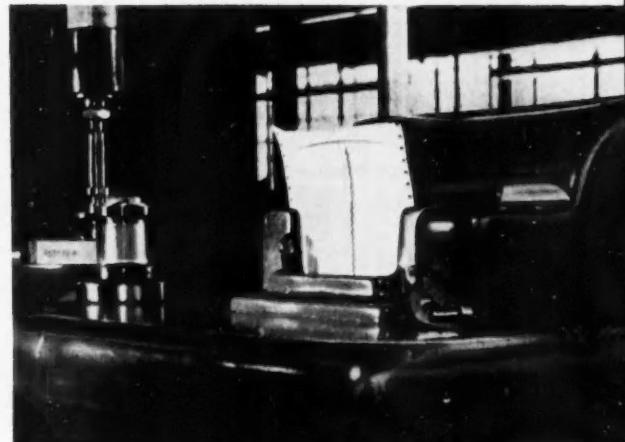
This is the Fellows Method in action. We would welcome an opportunity to discuss your gearing problems at your convenience.

## PRODUCTION DATA

Cutting	— 2 Cut Cam .005 Finish Cut	Preshave
Type of Operation	.....	.0045"
Feed per stroke of cutter	.....	700
Cutting time	.....	3.5 minutes
Shaving	— 2 Cycle Cam	
Shaving tool dia.	.....	3.5"
Shaving tool helix angle	.....	18°
Shaving tool R.P.M.	.....	252
Surface speed F.P.M.	.....	231
Shaving time	.....	40 seconds



FELLOWS SHAVED...by eight #4 Gear Shavers



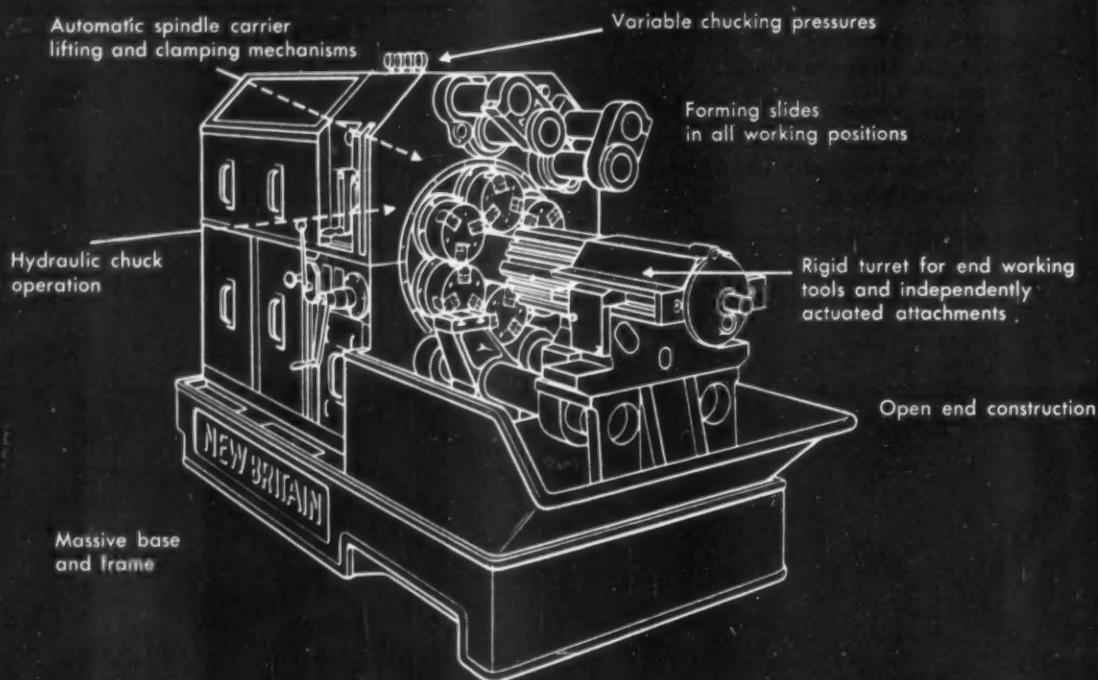
FELLOWS CHECKED...by four 8M Red Liners

## GEAR SHAPER COMPANY

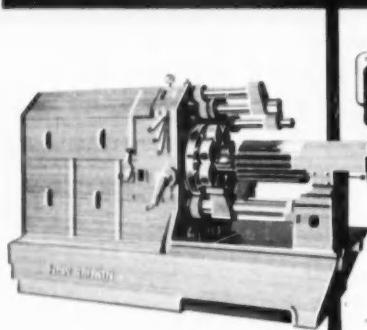
Head Office & Export Department: 78 River Street, Springfield, Vermont.  
Branch Offices: 323 Fisher Building, Detroit 2 • 5835 West North Ave., Chicago 39  
2206 Empire State Building, New York 1.

New Britain Builds 4, 6 and 8 Spindle Automatic

# CHUCKING MACHINES



A chucker designed with the extra power and rigidity for multiple operations on forgings and castings, involving both heavy and finishing cuts.



**THE NEW BRITAIN MACHINE COMPANY**  
New Britain-Gridley Machine Division, New Britain, Connecticut

... Machines for Making Progress  
Automatic Bar and Chucking Machines  
Precision Boring Machines  
Lucas Horizontal Boring, Drilling and Milling Machines  
New Britain +GF+ Copying Lathes

**NEW BRITAIN**  
*Automatics*

# You Can Get These SHELL MOLDING Benefits...

Higher percentage of sound, uniform castings that cuts rejects.

Casting surfaces almost pattern-smooth.

Pieces cast to closer finished dimensions—tolerances as close as .003 to .005 inches per inch.

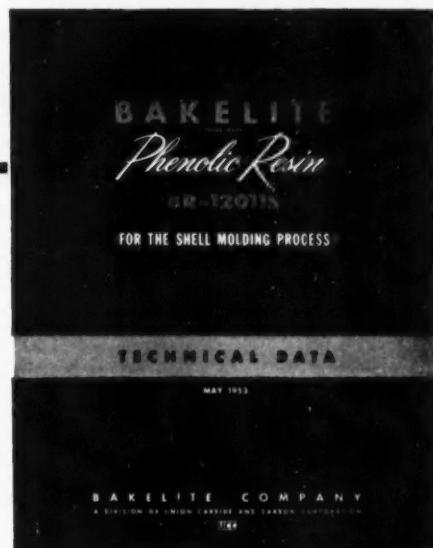
Reduced machining on intricate, complex shapes.



## When Your Foundry Uses the New **BAKELITE RESIN** TRADE-MARK Described in this Bulletin...

BAKELITE General-Purpose Resin BR-12011S has been specially developed to give greater latitude in mold-making. It can be subjected to a greater variation in operating conditions than ordinary shell molding resins. Shell molds reach minimum usable strength faster and retain strength longer at curing temperatures, permitting more leeway in curing time.

Shell molds made with this resin resist the tendency to distort upon ejection from the hot pattern plate, insuring better mating of mold halves. The molds also offer greater resistance to deformation during the pouring operation, resulting in castings that are more dimensionally accurate.



## Specify Castings made by SHELL MOLDING

Modernize your production methods with castings made by the shell molding process. Ask your foundry department or foundry supplier to write for data on BAKELITE Phenolic Resin BR-12011S. Address inquiries to Dept. RD-59.

### **BAKELITE**

TRADE-MARK

### **PHENOLIC RESINS FOR SHELL MOLDING**



### **BAKELITE COMPANY**

A Division of  
Union Carbide and Carbon Corporation



30 East 42nd Street, New York 17, N. Y.

In Canada:  
Bakelite Company (Canada) Ltd., Belleville, Ont.

# If you're in the market for special machines or special tooling...

► **Kearney & Trecker Special Machinery Division—an old hand in the business—has a brand new plant and greatly expanded facilities to build the big or small special equipment you need**

**T**HOUGH we've designed and built up to \$3,000,-000 worth of special machinery annually . . . have been in the field since 1898 . . . we've never publicized the fact till recently. Limited production facilities prevented taking additional orders.

But now we have a new plant built exclusively to produce special machines, special tooling and special adaptations of standard equipment. This plant, with approximately 200,000 sq. ft. of floor space, is equipped with more than \$2,500,000 worth of the very latest tools and equipment. It's at your service.

#### We've worked with the best of them

In practically every industry . . . automotive, shoe machinery, aviation, etc. . . . there have been many installations of Kearney & Trecker special machines. These machines were custom-built to solve unusual metalworking problems. They provide extremely high production even with exacting dimensional accuracy and fine surface finish requirements.

#### We're staffed with engineers who have learned the business from the ground up

Our Special Machinery Division engineering section has almost 100 widely-experienced design, project and production engineers. These men are up-to-the-minute on the latest developments in applied mechanics, hydraulics, electronics, metallurgy and allied fields. They know exactly how to utilize these advances in the design and construction of outstanding special machine tools. In addition, it has a full complement of experienced machinists and mechanics needed for special machine construction.

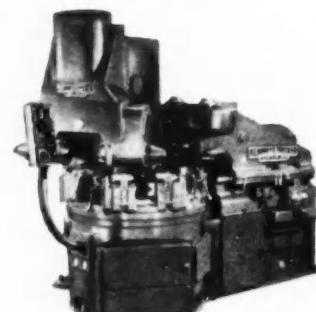
#### Every special machine is backed by the entire Kearney & Trecker organization

The Special Machinery Division is an integral part of Kearney & Trecker, a corporation that does an annual business in excess of \$25,000,000. Every product, every commitment we make, is fully backed by our reputation for quality, cooperation and ability to live up to promises. Every machine is designed, then built, to your specific requirements with ample reserve for emergencies.

#### We invite your inquiry

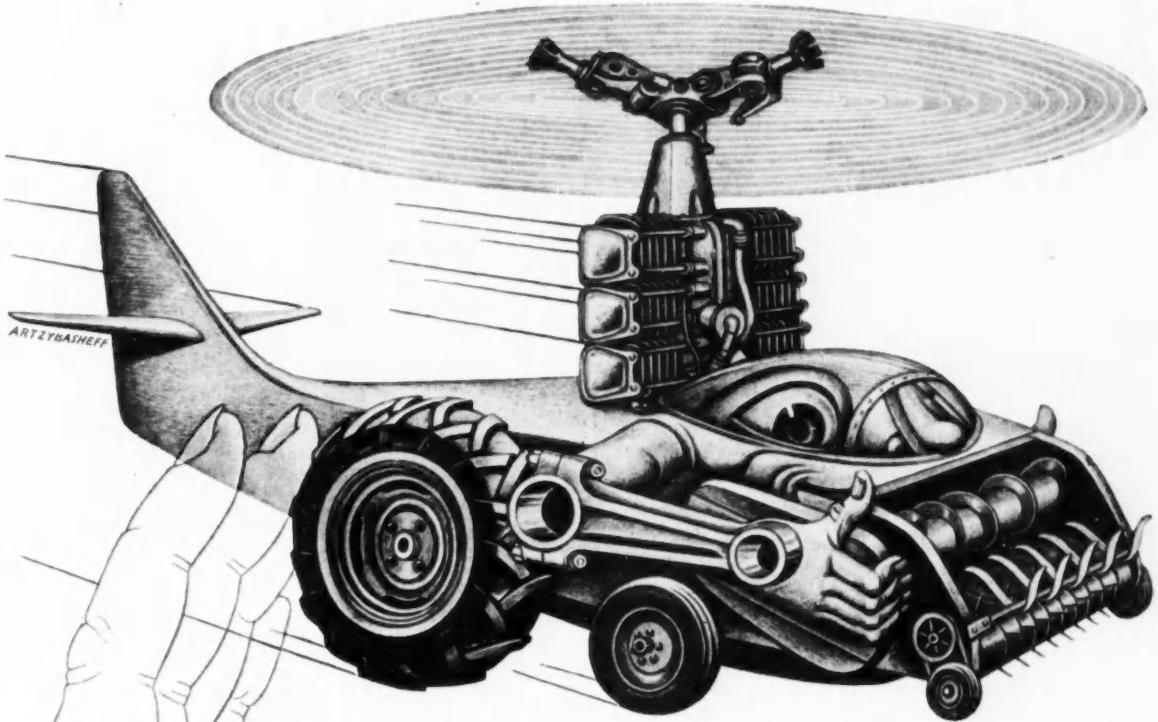
We'll be glad to provide you with any information we can . . . including sample machine specification sheets on typical installations, a brochure covering the expanded facilities of our Special Machinery Division, and details on our Customer Engineering Service. Furthermore, if you have special production machinery problems, have one of our senior Project Engineers analyze them, without obligation, of course.

Write, wire or phone the Special Machinery Division, Kearney & Trecker Corp., 6784 W. National Ave., Milwaukee 14, Wisconsin.



We've built special machines or adaptations of standard equipment for practically every industry. Here is a photo of a three-station rotary indexing machine we designed and built for a major automotive manufacturer.





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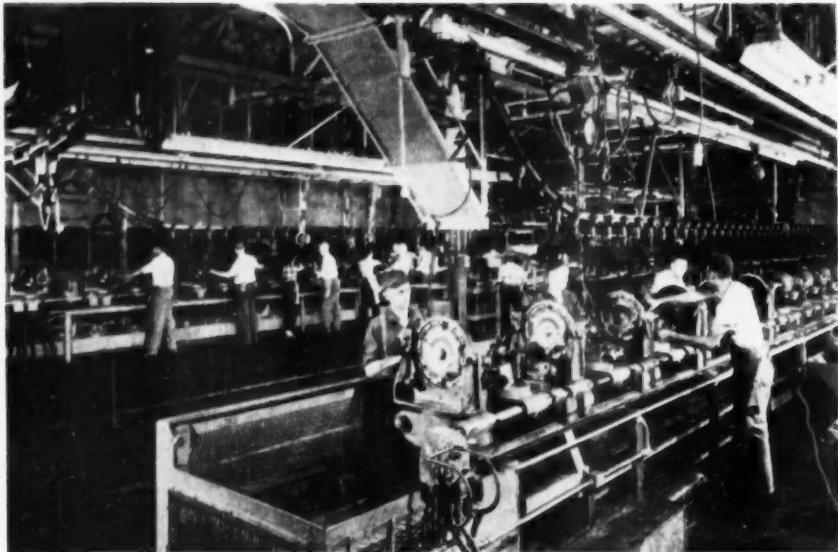
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Right—Close-up of one of the rolling machines, showing the subassembly on the table, with revolving head about to descend to roll the projecting tabs in place.

Left—Perspective of the two Powerglide final assembly lines with unloading in the foreground. At the left in the foreground is one of the fixtures about to be unloaded. It is pushed to the waiting elevator at the left for lowering to the chain conveyor for return to the loading end at the extreme right.

## New Tooling and Methods for Powerglide Transmissions

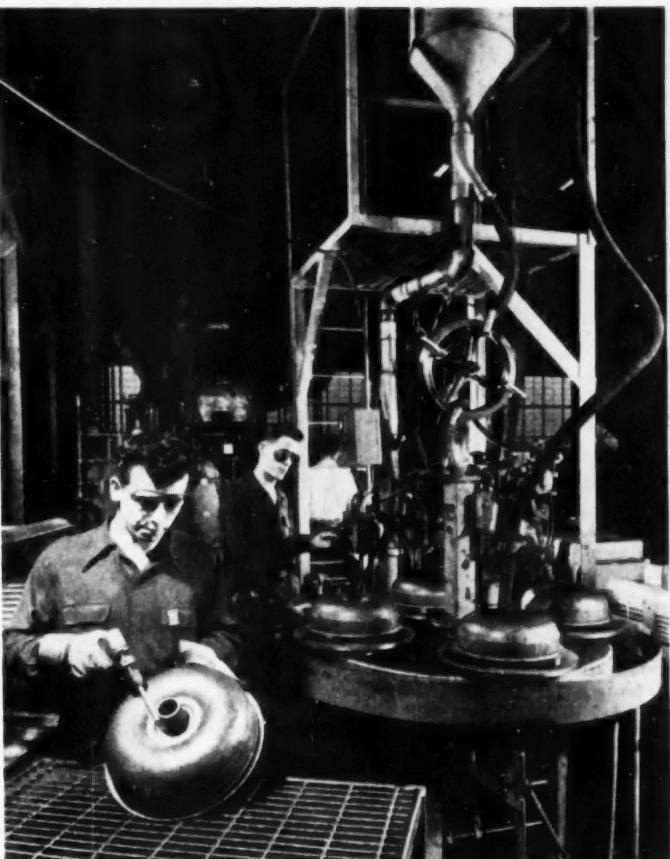
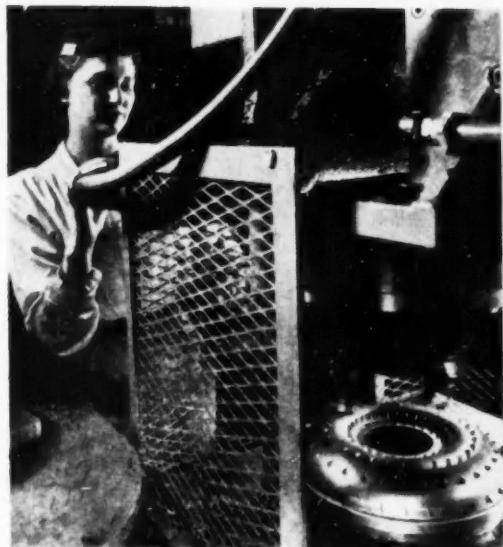
Below—General perspective of one of the integrated assembly conveyors for assembly of vanes into the outer shell. Vanes are installed by hand by operators in the background, final step being the placement of inner shell. The loose assembly then proceeds on the conveyor to the rolling machines in the foreground.



FACTED with an ever increasing demand for Powerglide transmissions the Chevrolet - Cleveland Plant has stepped up its production goals and has made some interesting improvements in methods and equipment incident to the basic design changes in the 1953 automatic drive.

The plant has grown in facilities to an impressive degree since the initial introduction of Powerglide. Mechanization and conveyorization have been expanded to the point where the plant now has almost four miles of monorail and gravity roller conveyors (see AUTOMOTIVE INDUSTRIES, May 15, page 34).

Torque converter fabrication and assembly which was moved from Flint some time ago has been completely reorganized in keeping with the advanced 1953 design. Elimination of two overrunning clutch elements as well as the adoption of an aluminum die-cast stator has reduced the number of vanes, only two different types of vanes being required—one for the primary pump, the other for the turbine. This simplifies



Right—Four-station rotary indexing table on which the submerged-arc welding operation is performed to join the press-fitted hub to the housing. The operator in the foreground is removing hardened flux. Loose flux is removed by suction and delivered to the hopper overhead.

By  
**Joseph Geschelin**

die problems and reduces the number of press setups. Moreover, the new vanes—now of tab type—are much simpler to make, do not require restrike operations, and are a great deal easier to assemble.

Perhaps the most important improvement is the elimination of the original method of copper brazing of the torque converter assembly. Not only does this eliminate the brazing furnaces as well as attendant operations and inspections; it dispenses with the large amount of copper formerly required for this operation.

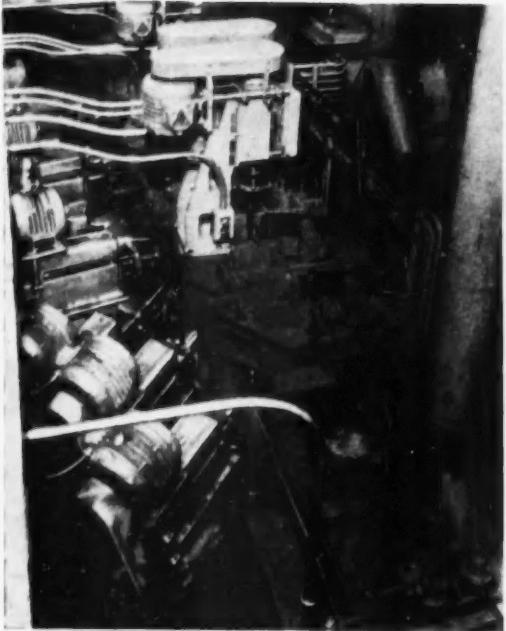
The new construction now employs vanes with projecting tabs which are fitted into suitable perforations in the inner and outer stampings for each half section. As will be shown later, these tabs are spun over in an automatic machine to produce a mechanically locked vane assembly. Later one of these sub-assemblies is securely spot-welded to the pump housing; the other goes to make up the turbine assembly.

Another item of design simplification is found in the new primary pump housing. For 1953 this becomes a lighter gage stamping to which is welded a simple tube which constitutes the hub. In production this has posed a more serious problem of machining the housing without causing distortion; and greater care in assembling and welding the hub section to assure concentric axial alignment of the final piece. The submerged-arc welding procedure for joining the hub to

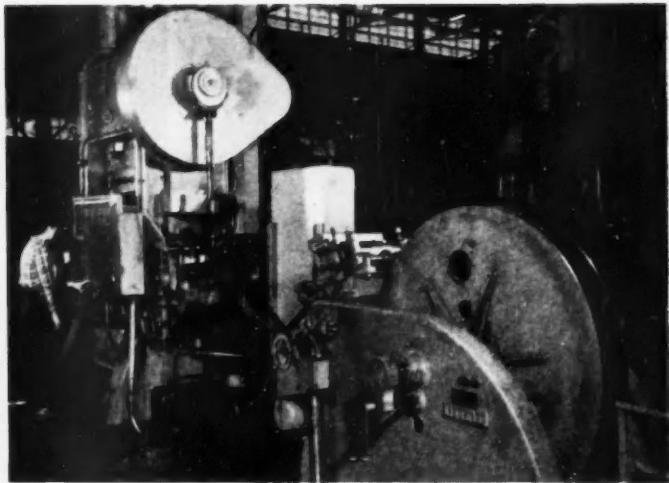
the housing is illustrated here. As shown, the welding machine has a four-station rotary indexing table, providing ample time for loading and unloading, welding at one station, and recovering the welding flux by means of suction hose.

The tabbed vanes are produced with relatively simple progressive dies installed in small Danly and Clearing presses, ready for assembly as they leave the press. Shown here is a typical press arrangement with Littell feeding and straightening rolls at the loading end. There is a Littell cut-off attachment for the skeleton at the opposite end. An interesting example of automation is the provision of a long slide under the press bed, serving to hold the vanes in a compact arrangement as they drop out of the die. Operators then remove a stack of vanes and load them into special trays for convenient dispensing on the assembly line.

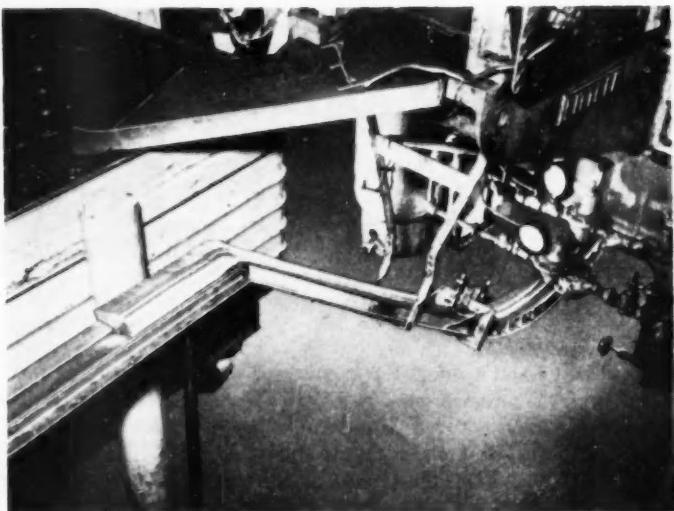
One of the finest examples of an integrated assembly line is the square-shaped transfer conveyor for vane sub-assemblies now in use on the turbine and pump lines. As illustrated, the conveyor traverses a series of work stations at which vanes are assembled by hand into the inner and outer shells on each line. The number of work stations can be increased at will to meet greater production requirements. At its outer periphery the conveyor line traverses two special



Overhead view of one end of the W. F. & John Barnes Progress-Through machine for converter bell housings, showing the compact group of nine Kreuger heads added for 1953 production. The loading end of the machine is to the right in this view, the end of the original machine being the station in foreground.



General arrangement typical of Danly and Clearing presses for progressive die production of torque converter vanes. The Littell coil feed is in the foreground, with a Littell cut-off attachment at the other end.



Close-up of unloading end of vane presses to show the slide arrangement. Directly connected to the punch-out end of the progressive die, the slide permits vane stampings to be pushed one-by-one onto the slide for unloading at table height.

machines fitted with Baker drill units, having a special fixture for rolling over the tabs after assembly. One machine rolls the tabs on the inner shell, the other completes the operation by rolling tabs on the outer shell. A press nearby is employed for restriking one diameter.

The conveyor line operates on an accurately timed sequence rather than continuously, with a dwell of sufficient duration in keeping with the cycle of the rolling machines. Thus the conveyor automatically stops and starts with dwell not only for rolling but for positioning at each machine as well as time for the ram to retract and release the work. One of the major problems in the design of the conveyor was that of achieving a precise spacing of fixtures and location of fixtures with respect to the rolling machines to assure accurate indexing of the fixture under the ram.

Due to the relatively fast cycle in the rolling machines, an individual operator has time for installing only part of the vanes required for a sub-assembly. A warning light at each assembly station tells the operator when to stop fitting vanes. This pause is important as a safety measure. Depending upon productivity at any given time, a sufficient number of stations are manned to permit the installation of the complete set of vanes before reaching the rolling machines.

Actually then the assembly of vanes is a step-by-step process handled by a number of operators.

Chevrolet-Cleveland also boasts an outstanding "first" in the development of a transfer machine. When we described this operation originally, they had two short W. F. & John Barnes Progress-Through transfer machines for various drilling and tapping operations on the converter bell housing. With the adoption of the automatic low starting gear arrangement for 1953 this housing required the addition of a large number of long oil galleries, closely spaced and at odd angular locations to serve as valve portings. Drilling these additional holes required several extra stations and additional heads and ordinarily

(Turn to page 100, please)

# A Comparison of Fuels

in

## City-Bus Operation

TABLE I

### Diesel Fuel Inspection Data

Gravity	39.5
Sulfur, %	0.16
Flash, PM	120
Ignition Quality, Cetane Number	50
Distillation:	
IBP	300
50%	460
90%	550
EP	620

TABLE II

### Gasoline Inspection Data

Gravity	60.7
Sulfur, %	.06
Octane Number, Research	88.0
Distillation:	
IBP	110
10%	140
50%	230
90%	335
EP	400

TABLE III

### Commercial Propane

C <sub>2</sub> Content	95% minimum
Vapor Pressure @ 105° F.	225 psi max.
Hydrocarbon Residue (Hg. freeze)	2% max.
Non Volatile Materials (1000 mls):	
Residue boiling above 100° F.	0.5 ml. max.
Oily material	none
Corrosiveness (Copper—3 hrs. @ 122° F.)	negative
Water Content (Cobalt Bromide)	dry (blue)
H <sub>2</sub> S	Free
Mercaptan	Free
Total Sulfur	12 grains/100 CF, max.

By F. C. Burk, E. S. Black and L. J. Test  
THE ATLANTIC REFINING CO.

THE three fuel types presently available for bus operators are gasoline, Diesel and LPG. Unfortunately, while much information on the economies of these three fuel types has been presented in the literature, it has been difficult to draw conclusions from these reports because, to our knowledge, no data have been published on tests made using the three fuel types in comparable equipment with substantially identical side by side operation.

This problem was discussed with the Harrisburg Railway Co., Harrisburg, Pa., and it was agreed to conduct a joint investigation to obtain the desired information.

To this end a program was prepared whereby new equipment designed for each fuel type would be purchased and put in its normal service. Twenty new buses, 10 of which were Diesels, five gasoline and five LPG were purchased. They represented the latest designs offered by the manufacturers for the three fuel types. In addition, two older gasoline engine buses were converted to use LPG. These vehicles were put

into operation in January, 1951, and were taken off test two years later. During this period each of the new buses had been operated about 80,000 miles. The original cost of each bus, in round numbers, for each fuel type was as follows: gasoline, \$15,000; LPG, \$15,375; and Diesel, \$15,750.

### Fuels

Commercial regular grade Diesel fuel and commercial regular grade motor gasoline of high quality were used throughout the test in the Diesel and gasoline powered units. The LPG used was essentially a high quality commercial propane. Typical inspec-

(Turn to page 120, please)

# Cars on Credit

## S

UPPLYING CREDIT for the purchase of cars on the instalment plan has become a big and highly competitive business in recent years. Credit extensions for this purpose amounted to a record 10 billion dollars last year. This was two-thirds more than the 1949 volume and three times that of 1941, the most active pre-war year.

Sales finance companies, the traditional source of automobile credit, are supplemented by the growing number of banks which have entered the instalment credit field during the past decade. In most communities this means that there are several sources of credit available to finance sales of new and used cars. As a result, funds for such financing have been in generally ample supply, despite the rapidly rising needs of borrowers.

Ready availability of instalment credit is essential to automobile dealers. A large proportion of car purchases are financed in part through the use of credit, and this proportion has increased substantially over the postwar period. Credit extensions last year accounted for 38 per cent of the retail dollar volume of automobile dealers, as compared with 28 per cent in 1951 and 22 per cent in 1948. Moreover, these figures understate the role played by credit in automobile financing, since a sizable portion of dealers' sales volume consists of repair work and sales of parts and accessories.

The announced intention of the automobile industry is to increase the output of cars from 4.3 million units in 1952 to over 5.5 million this year. So far this estimate has been backed up by production at an annual rate of 6.1 million units in the first three months of the year. If this rate of output is continued and inventory accumulation is to be

avoided, dealers' sales will have to expand by about one-third this year. Obviously, this higher volume of sales would require a very substantial increase in the amount of instalment credit extended, even if the proportion of credit buying does not increase further. In these circumstances, the question of whether lenders will supply even larger amounts of funds at the liberal credit terms currently prevailing becomes an important factor in the sales prospects for new and used automobiles.

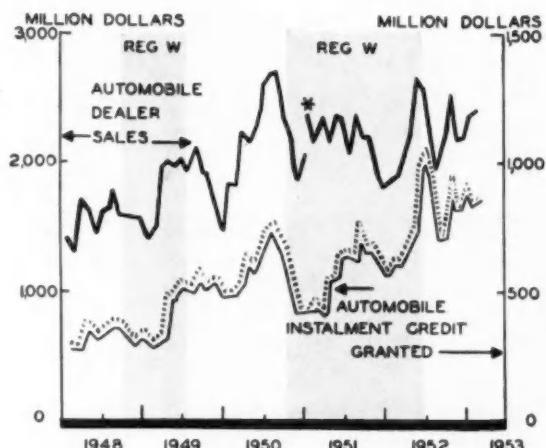
## Credit Buying Bulks Large

New passenger car sales last year totaled 4.2 million, a decline of about one-sixth from the 5.1 million sold in 1951. Although no total figure on used car sales is available, new car dealers sold 7 million used cars in 1951 and 6.9 million in 1952, including those which were wholesaled to used car dealers. Taking into consideration privately arranged sales and direct purchases and resales by used car dealers, a reasonable estimate of the total number of used cars sold in each year might be in excess of 8 million units.

Most of these cars were financed in part through the use of instalment credit. According to the "Survey of Consumer Finances," 55 per cent of all consumers who purchased automobiles in 1951 utilized credit (including single payment loans). It seems clear that this proportion rose much further last year, perhaps to 65-70 per cent. The increased importance of credit buying is evidenced by the fact

## CAR BUYING IN 1951

	New cars	Used cars
Average purchase price	\$2,390	\$790
Buyers making trade-ins	81%	59%
Average net outlays	\$1,440	\$570
Buyers using credit	47%	60%



\*REVISED SERIES

*Instalment credit extensions for purchase of cars have risen more rapidly than dealers' sales.*

that the volume of instalment credit extended on automobiles increased by one-third from 1951 to 1952, while the number of cars sold declined 5-10 per cent.

The "Survey" revealed a significant difference between the frequency with which credit was used in 1951 for new and used car purchases. Fewer than half of the new car buyers required instalment credit to finance their purchase, as compared with six out of 10 used car buyers. The reasons for this can be found in the differing financial positions of new vs. used car buyers. First, four out of five new car buyers already had an automobile which they traded in or sold privately, as against three out of five of those who bought used cars. This narrowed considerably the difference in the average net outlays of the two groups (see table). Second, over half of the new car buyers earned an income of \$5000 or more, as compared with only one-fifth of those who purchased used cars. More than three-fifths of the used car buyers were in the \$2000-\$5000 income class.

All "Survey" findings point to persons of moderate income as the most frequent users of credit in financing car purchases. Buyers with large incomes often have the resources to purchase without resorting to the use of instalment credit. On the other hand, most of those with low and irregular incomes are unable to obtain credit, both because of their financial situation and the fact that they usually purchase the older used cars which are considered to be less desirable collateral. Moreover, the average user of credit has only limited holdings of liquid assets. In 1951, six out of every 10 car buyers who held less than \$500 in liquid assets early in the year borrowed, while only one in 10 of those holding liquid assets of \$2000 or more utilized credit in making their purchase.

These characteristics emphasize the importance of credit terms in bringing credit buyers into the automobile market. Smaller down payments and a moderate reduction in the required monthly pay-

ment are of considerable importance, not only in attracting additional buyers, but also making it possible for credit users generally to buy more expensive cars.

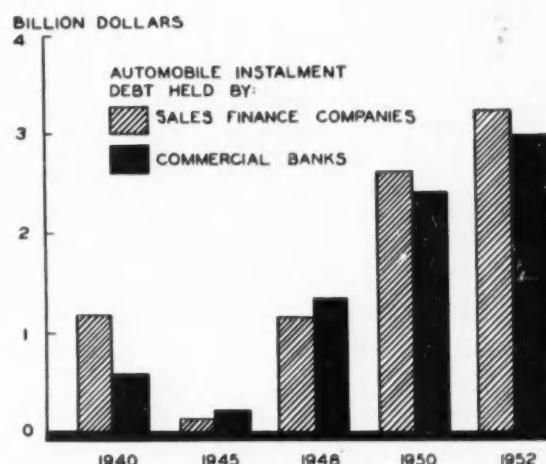
Prior to the ending of Regulation W last spring, borrowers were required to pay one-third down and the balance in 18 months. Since then credit terms have been markedly liberalized. Although terms vary from one lender to another and among localities, new cars commonly are being financed at one-fourth down and 24 to 30 months to pay. Used car terms have continued somewhat more restrictive, with one-third down and 18 to 24 months to pay usually required. The relaxation in terms which has taken place undoubtedly was the major factor leading to the sharp rise in the number of cars bought on credit last year.

### Competition Among Lenders

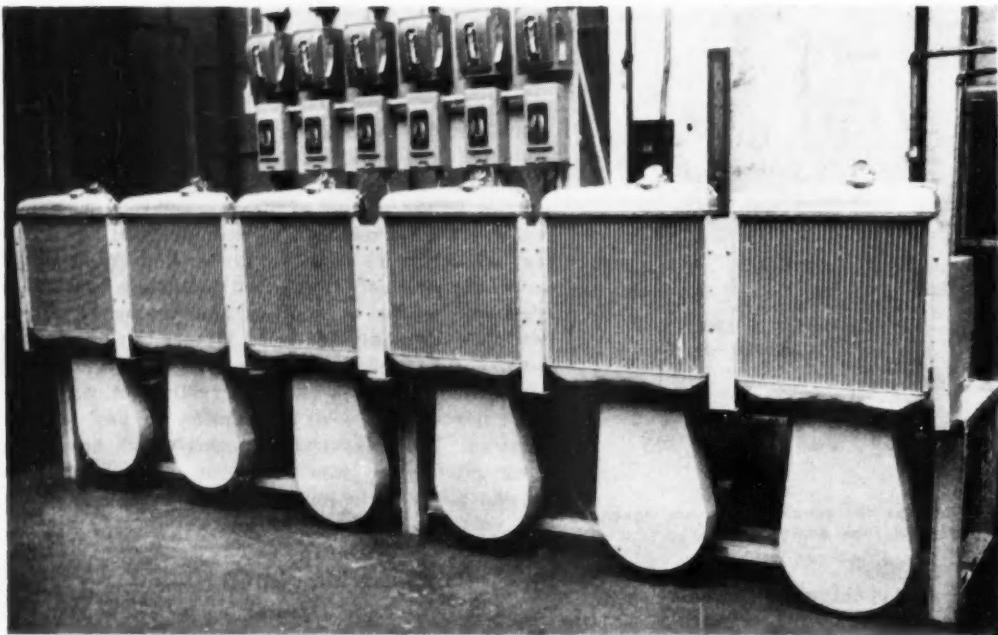
Instalment credit is extended to car buyers in one of two ways. Most commonly, financing is arranged through the dealer, who subsequently sells the credit contract to an institutional holder. A second and growing method of financing involves direct negotiations between the borrower and a lending institution for a loan secured by and for the purpose of purchasing a car.

A variety of lenders extend automobile instalment credit. These include industrial banks and loan companies, credit unions, and automobile dealers themselves, who may hold and service some or all of the credit paper they originate. The lion's share of the business, however, is done by sales finance companies and commercial banks. At the end of 1952 sales finance companies held about half and commercial banks 44 per cent of the 6.8

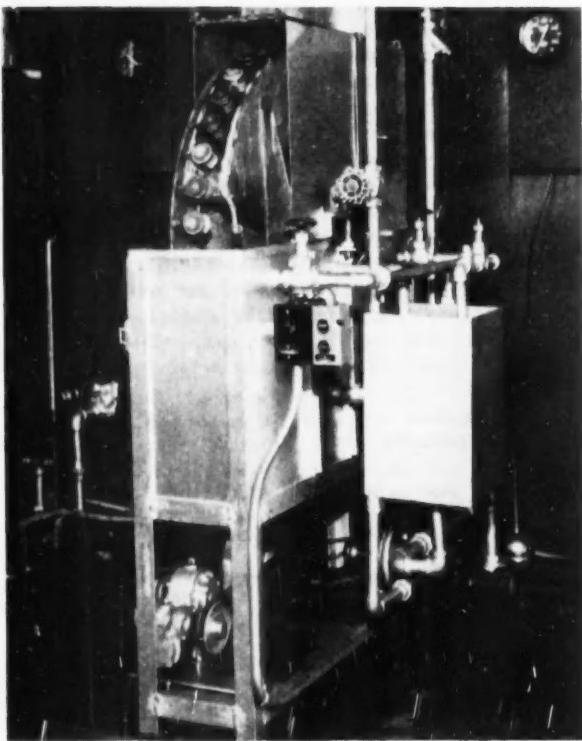
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*Automobile loans at commercial banks and sales finance companies are up sharply.*



Aluminum radiators being tested to determine the effects of various kinds of water and anti-freeze solutions. In this setup radiators are connected to a production cylinder block and water pump assembly to have the commonly used materials of a cooling system in contact during the test.



This is one of the thermostat life test machines developed at Harrison. It consists of a large drum fixture holding test thermostats, the drum being immersed half-way in a tank containing water or glycol mixture maintained at a predetermined temperature, held above the full-open temperature of the thermostats. The drum is revolved slowly to immerse the parts for a definite time cycle. As the thermostats emerge from the hot mixture they are sprayed with city water, causing them to cool and close.

## New Radiator

NOT only is engineering research closely coordinated with product design at the Harrison Div., General Motors Corp., Lockport, N. Y., but the research facilities are tailored specifically to fit the pattern of forward product design. It is of interest that engineering facilities are undergoing extensive expansion at the present writing. When completed in the near future, these facilities will provide Harrison with one of the most advanced laboratories in the heat transfer field.

Fundamental and commercial research must look to the future, if the art is to keep ahead of the requirements of users of the product. One pointed example stems from comments made by Robert Cass, SAE president, at the March meeting of Buffalo Section, SAE. From experience gained in his connection as consultant to NPA, he warned that in less than 10 years the demand for copper will exceed the supply. If that occurs, it may make the use of copper a liability from a cost standpoint since the price is likely to boom under such conditions.

This pointed warning is bound to accelerate development work on aluminum radiators; it



**Materials and Designs for Heat Transfer Equipment Are Tested for Efficiency and Durability Under All Conditions in Laboratory of Harrison Division of General Motors Corp.**

By Joseph Geschelin

## Test Facilities

Schematic drawing of the Harrison wind tunnel installed some time ago. It is about 160 ft long; maximum air velocity is 100 mph; and maximum temperature 125 F.

dovetails with the continuing search for alternate materials that may replace copper. Much of the work in recent years points to aluminum as the best known copper-replacing material and a large number of Harrison all-aluminum radiators already are installed in passenger cars in the hands of private owners to determine their behavior and useful life under normal operating conditions all over the country.

From a practical standpoint the present stumbling blocks to the adoption of aluminum are: (1) development of a suitable flux that would be available at a price and in the enormous quantities required by the industry, and (2) development of simple mass production techniques and equipment to reduce fabrication costs. These, and allied problems under study at the present time, are being coordinated with parallel development on the part of Alcoa and other aluminum producers.

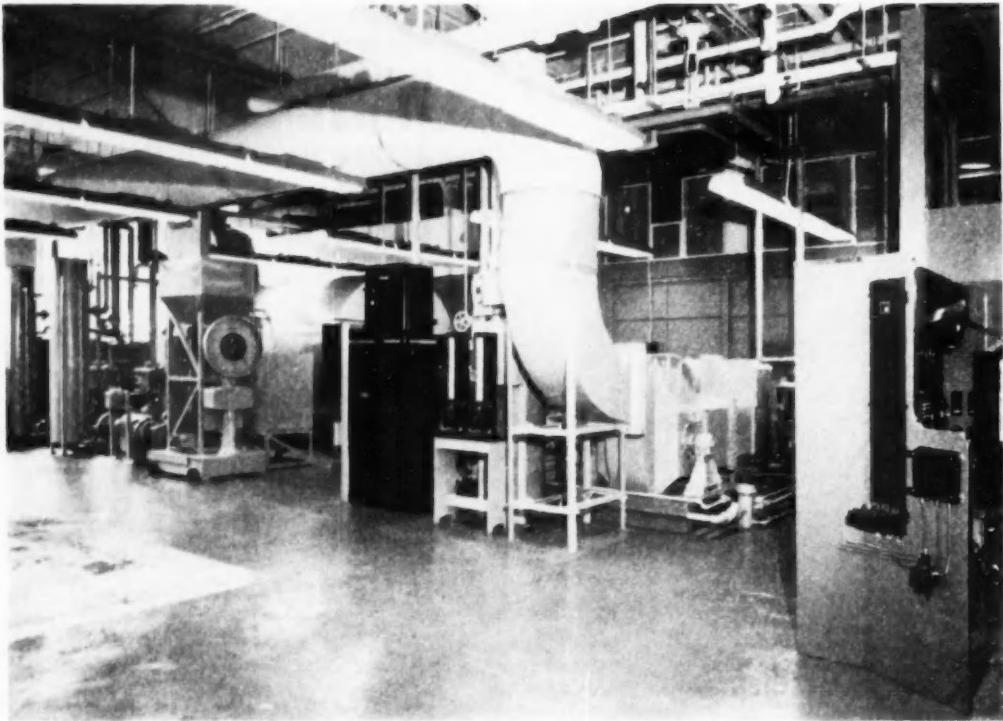
While fabrication studies are in progress in one area, the suitability of aluminum for radiators is being studied in other departments. One important area of research is covered by the activity of the corrosion laboratory, to which reference will be made later.

Perhaps the best way to show how research facilities dovetail with product development is to trace the

course of some specific problems. Easily the most important is that of fitting a cooling system to the requirements of the powerplant and styling of the car of tomorrow.

Research may well begin with the new engine supplied by the automobile manufacturer. The engine is installed on one of the dynamometers in the laboratory and put through a series of tests to determine its heat rejection characteristics. In general, the new OHV, high compression V-8's have higher thermal efficiency with less heat rejection, and will tolerate a smaller radiator core.

From the dynamometer data calculations are made to determine the type and size radiator core best suited for this particular application. At this point Harrison employs its technique of producing a "one-ft-square" test core which is then subjected to a complete schedule of testing in the impressive "Dissipator" equipment. Of modern design and provided with the latest types of instrumentation, the Dissipator provides a complete heat transfer analysis of the one-ft-square core. Because the mass of liquid is small and temperature differences sometimes minute, this equipment is provided with one of the most sensitive Leeds and Northrup temperature recording instruments known



**Basic data dissipator installed in the Harrison laboratories is designed to determine heat transfer coefficients and resistance factors of various types of cooling surfaces. The 12 by 12 in. sample is mounted in air ducts with liquid circulating lines connected to the inlet and outlet fittings. Air flow is measured by flow nozzles of various sizes; liquid flow is determined by weighing after it leaves the sample.**

to the art. It is calibrated to give readings accurately to 0.1 F, 0.01 F, and even 0.001 F on parallel scales.

When this program has been completed, the model shop serving the research laboratories then fabricates a full-sized radiator, complete in every detail. This radiator is subjected to a test schedule in another, larger Dissipator. Test results with the radiator do not always confirm the suitability of the initial test core section. And from this point on it is necessary to make the usual engineering compromises in the core section to come up with the desired characteristics in a full-sized radiator.

The gap between the performance of a one-ft-square core section and that of the full-sized radiator may be appreciated by considering the variables introduced by the positioning of the core in the chassis, the effect of fan mounting on the effective area swept by the fan, and what is even more important—the effect of exterior sheet metal on the flow of air into the under-hood compartment.

More recently the problems of cooling have been still further complicated by the installation of an air-conditioning system condenser immediately ahead of the radiator core. That, too, has become a problem for investigation in these laboratories.

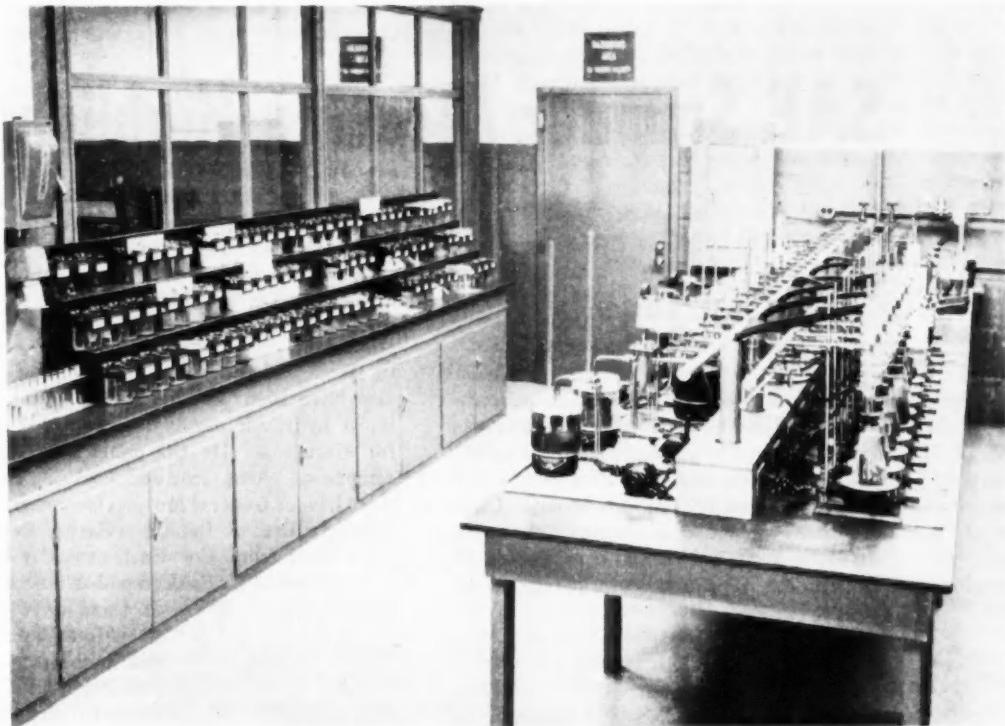
While these projects are under way another group is occupied with a study of the effect of the industrial stylist on the behavior of the cooling system. They start in the engineering department of the customer

and must evaluate the problem from studies of wood mock-up models of the front end styling of the car. Major elements to consider are: front end sheet metal; radiator grille layout; positioning of bumpers, bumper guards, and decorative elements that throttle the entry of air to the radiator or behave as air deflectors which sometimes reduces the effectiveness of a radiator core by as much as 30 per cent.

Incidentally, this is the point at which styling sometimes upsets efforts at materials conservation. If suitable compromises in front end design can be effected, the weight of copper can be reduced by as much as 30 per cent in extreme cases.

In any event, the effects of air flow, restrictions to air flow, and the behavior of the cooling system are studied under full scale operating conditions in the enormous "Hot Tunnel" laboratory. The hot tunnel, one of the most impressive in the industry, is employed for testing cooling systems as well as air-conditioning systems. It is designed to supply air at temperatures up to 125 F in the chamber. The wind tunnel section is adjustable to simulate any desired wind conditions, the engine being loaded by a chassis dynamometer to operate under all manner of road speeds.

As the research project progresses, the effects of sheet metal restrictions, deflections and eddy current effects from front end obstructions, etc, can be evaluated. Eventually, the laboratory will be in a position to recommend changes for study and body



**View in corrosion laboratory shows some of the static and active test procedures on test panels of various metals. Tests include: constant temperature tests at various temperatures with and without aeration; circulating solution tests with cyclic variations in temperatures with and without aeration; temperature and pressure cycle tests, non-circulating; alternate wet and dry cycles; and galvanic couple tests.**

engineering groups at the various automobile plants.

Assuming the usual degree of cooperation between cooling system engineers and body stylists, some compromises will be effected by a give-and-take process before the front end design has been frozen for production. At this stage Harrison can resume its studies leading to the development of a cooling system which must function acceptably within the established framework.

In addition to the hot tunnel, the Division also has a large cold tunnel capable of testing complete vehicles. It is designed to produce air temperatures as low as minus 20 F. This equipment can be used for a variety of purposes, one of its principal functions being the testing of car heaters and defrosters. Recessed in one wall of the chamber is a huge fan assembly, 10 ft in diameter. Actually, there are two fans mounted on the same coaxial drive but rotating in opposite directions to provide steady air flow conditions capable of simulating winds up to 100 mph.

The corrosion laboratory, mentioned earlier, provides facilities for testing the resistance or susceptibility to corrosion of various types of materials used in the cooling system. This is done by immersing metal samples and radiator core sections in a variety of synthetic solutions. As nearly as possible, these solutions approximate water found in representative sections of the USA.

In addition, other test panels are subjected to solu-

tions containing rust inhibitors, and various types of anti-freezes. Tests are conducted under controlled temperature conditions; some with controlled aeration to observe the combined effects of air and heat.

During the past few years more attention has been given to the use of radiator pressure caps. Several makes of cars are using 13 psi caps in 1953, although most use lower pressures. One thing is obvious, the higher the pressure within the system the higher is the boiling point of the solution. Since higher pressures make it safe to carry solution temperatures above the normal boiling range, it becomes practical to employ still smaller radiator cores.

On the other hand, higher pressures produce greater stresses in the entire structure and thus introduce some new problems for investigation. As a result, accelerated test equipment has been placed in operation to test various types of radiators under controlled temperature conditions and with a controlled program of pressure applications. This type of study provides a background for establishing ceilings on pressures as well as modifications in design and production methods to handle the increased thermal effects.

Still more recently, the Division undertook an ambitious program leading to the development of car air conditioning, its major interest, obviously, being to produce a line of evaporators and condensers for this purpose.

# SAE Summer Meeting Highlights

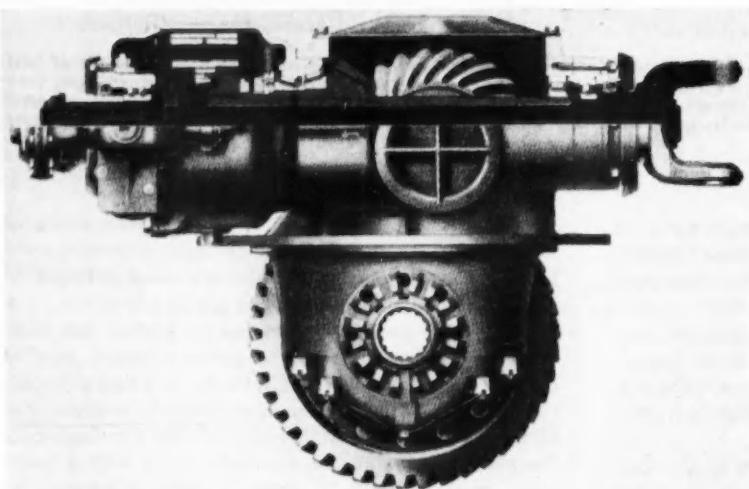
By James R. Custer

**A**N elaborate program of technical sessions, committee meetings and recreation, including sports and social activities, was provided for the 1953 Summer Meeting of the Society of Automotive Engineers held the second week of June at Atlantic City, N. J. Attendance was estimated at close to 2500 members and guests. The technical section consisted of 31 engineering papers, 21 of which were presented at

Since power steering was introduced on passenger cars in 1952, over 500,000 integral units have been installed and this type has had the field almost exclusively to itself. In the meantime steering gear companies also have been developing the linkage type and this latest hydraulic mechanism provided a timely subject for discussion. On the panel were engineers of five companies—Ross Gear and Tool Co., Saginaw Steering Gear Div. of General Motors, Gemmer Mfg. Co., Bendix Products Div. of Bendix Aviation Corp., and Monroe Auto Equipment Co. Each company displayed a cut-away model of its linkage power steering system. Four of them have been announced or will be announced soon as optional equipment for certain passenger car makes, so a lively competitive battle between the two types can be expected.

Saginaw was represented by C. W. Lincoln, chief engineer; Ross by W. K. Creson, vice president—engineering; Gemmer by Charles F. Hammond, chief engineer; Bendix by T. H. Thomas, manager, automotive engineering; and Monroe by I. N. Schatzka. P. H. Pretz of Ford Motor Co. was chairman. At the end of this session, features of the linkage and integral designs were summarized by Francis W. Davis, a pioneer in the power steering field.

After the engineers described the construction and operation of their respective linkage mechanisms, the question and answer period brought out many of the advantages and disadvantages of the two types. It was left to the listeners to determine their value, particu-



Features of the new SLD tandem drive rear axle unit introduced by the Timken-Detroit Axle Co. are: optional inter-axle differential; top-mounted, straight-line final drive; rubber torque rod bushings and rubber spring seat bushings which eliminate metal-to-metal contact. This part-cutaway view of one of the components shows details of the optional inter-axle differential of concentric spur gear design with cab-controlled power lockout.

three symposiums on corrosion prevention, preignition, and the Arctic. There were 65 committee meetings on the agenda.

The round table discussions again proved exceptionally popular and outnumbered the sessions at which technical papers were presented. Among the timely round table topics were power steering, plastics, improved passenger car brakes, 12 volt versus 6 volt electrical systems, bimetallic pistons, and heat absorbing glass.

larly after years of service. The linkage type was admitted to be more accessible, but on the other hand the integral type has the protection of the engine compartment. The linkage type is affected by less heat and has less parts, but the integral type requires less hose and is more compact. At present costs favor the linkage type, which sells at \$130 to \$150 compared to \$175 for the integral type. However, it was predicted that a 10 to 15 per cent reduction of the integral type price would be announced for next year's models and that

further reductions in costs would be made possible by volume production to lessen the price differential between the two types.

Groove wear in aluminum pistons and the use of cast-in inserts, their design and method of bonding occupied the attention of a large group of engineers during an afternoon session. Inserts properly bonded will remain bonded throughout the life of the piston, still giving satisfactory service at 200,000 miles when disassembled for examination, it was reported. A. M. Brenneke, chief engineer of the Manufacturers' Div., Perfect Circle Corp., was chairman of this meeting.

It was agreed that tinted glass now in use in car windows and windshields reduces glare and absorbs heat during the daytime, but as to its nighttime effect on driver vision, there was a difference of opinion. It was stated that a check on reports of its adverse effect on viewing outdoor motion pictures revealed them to be unfounded.

Burning and pitting of Diesel exhaust valves associated with fuels and lubricants are due primarily to their additives, engineers agreed. When conditions are right to produce burning and pitting, it does not make much difference to the valve whether it is in a two-stroke, four-stroke, gasoline or Diesel engine. Metallic deposits are particularly destructive, but valve condition could be improved by proper scavenging.

Problems in converting to the 12-volt electrical system were outlined at another round table discussion. Panel members listed changes required in bulbs, igni-

tion, battery, wiring and accessories, which indicated an overall cost penalty even at higher production rates. Battery servicing difficulties, lamp filament problems and production tooling costs were analyzed. Finally, the question was raised from the floor as to the necessity for going to 12 volts for high compression engines.

Brake improvements were recognized by round table speakers as paramount to cope with modern driving conditions. Aircraft experience was said to be of little help to automobile engineers because braking requirements are so different. Future requirements were predicted by one speaker as including non-self-energizing power brakes with automatic control to meet varying road surface conditions.

At the plastics round table, which was presided over by C. F. Nixon of General Motors, it was revealed that car makers are placing considerable emphasis on investigating functional uses of reinforced plastics. They are no longer regarded as substitutes, but are believed to be better materials than those replaced. All engineers agreed that the current average of nine lb of plastics per car will increase rapidly, regardless of plastic body development.

The Timken-Detroit Axle Co. displayed its new tandem drive rear axle unit with double reduction final drive. It is designed for 10:00 x 20 tires and 40,000 lb GVW. Available as optional equipment is a spur gear inter-axle differential, a sectional view of which is shown elsewhere in this article.

Extracts from some of the outstanding papers at the technical sessions are presented herewith.

## Hot Fuel Priming for Cold Weather Starting

By Everett Rowland  
Wright Air Development Center

SINCE the evaluation of heated fuel as a priming fluid gave conclusive results that, under the proper conditions, reciprocating type engines could be successfully started at extremely low temperatures, a hot fuel priming system was developed which was readily adaptable to airplane use either for retrofit or as original equipment. The hot fuel priming system is simple, compact, and lightweight. It consists of a tank enclosing an electrical heater, an electrical control box, and the necessary wiring and fuel lines to connect into the priming system. The additional weight required per engine to add the hot priming system to an airplane including wiring, plumbing and mounting brackets will vary from 12 to 15 lb depending on engine model and available location in the airplane. Fig. 1 is a schematic sketch of the hot fuel priming system. The principal units of the system are as follows:

**TANK**—A cylindrical tank enclosing an electrical type heating element is used to heat the priming fuel. The capacity of the tank will vary from

three to five qt, depending on the size of the engine on which it is to be used. The heating element is designed to operate on the same current

capacity as the engine starter and operates on 24 volts dc. The power connection of the heater element protrudes through the bottom of the tank and the other end is grounded to the tank.

**THERMOSTAT**—The heater tank is equipped with a thermostat to control the temperature to which the fuel

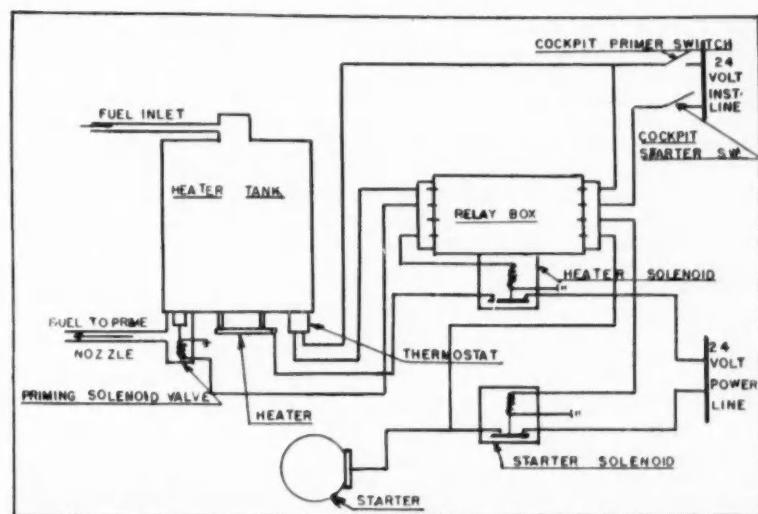


Fig. 1—Schematic sketch of heated fuel priming system.

is heated. This thermostat can either control the fuel to a constant temperature or to a varying temperature, depending on the ambient temperature. With varying control of the fuel, the thermostat would be designed to operate through an ambient temperature range of -65 F to +50 F and to control the temperature to which the priming fuel is heated in inverse ratio to the ambient temperature. At +50 F no fuel heating occurs, and at -65 F the fuel is heated to 220-240 F. For constant temperature control, the thermostat would be designed to control the priming fuel to 220-240 F at any ambient temperature.

**CONTROL BOX**—An electrical control box contains the relays necessary to control the function of the hot fuel priming system. This box is equipped with terminals for connecting it into existing priming and starting circuits.

**PRIMING SOLENOID VALVE**—The priming solenoid valve normally furnished on the standard engine priming system can be used.

The operation of the hot fuel priming system is as follows (reference Fig. 1): By engaging the primer switch and starter switch, the system is placed in operation. The primer switch should be engaged first, as the electric circuit is such that closing the primer switch prevents the starter from being engaged when the starter button is pressed. This engages the heating element. The heating elements will remain on until the fuel in the heater tank reaches a temperature of approximately 220 F as set by thermostat. When this temperature is reached, the heating element is automatically shut off and engine starter is energized and at the same time the priming solenoid valve is energized and cranking and priming occur simultaneously. By the addition of another switch the priming solenoid valve can be placed under the control of the operator permitting intermittent priming which is desirable on some engines. When the starter is no longer needed to maintain engine speed, the starter button is released. This permits the heating elements to go on and heating continues as long as the priming switch is on. After the engine is warmed up sufficiently, the hot fuel primer can be disengaged.

To date limited flight tests have been conducted with airplanes equipped with this hot fuel priming system. An airplane powered with R-4360 engines was tested in Alaska, and the lowest temperature at which starts were attempted was at -50 F

after the airplane had soaked for 72 hr at temperatures from -50 F to -54 F. Successful starts were obtained at this temperature and at all

higher temperatures. Tests on aircraft equipped with smaller engines have been conducted in the laboratory with successful results.

## Uniflow vs. Loop-Scavenging

By P. H. Schweitzer  
The Pennsylvania State College  
and  
C. G. A. Rosen  
Caterpillar Tractor Co.

**E**ARLIER automotive two-stroke cycle engines had uniflow scavenging, which is acknowledged as the most perfect scavenging system. Nevertheless, recently several small loop-scavenged engines have made their appearance. Is this a step backward dictated by European poverty?

The specific output of a two-stroke cycle engine is largely determined by its scavenging efficiency which is a measure of the success in clearing the cylinder of the residual gases from the preceding cycle. The bmepl of an

engine can be expressed as (see P. H. Schweitzer — Scavenging of Two-Stroke Cycle Diesel Engines, Macmillan, 1948):

$$bmepl = \frac{0.4 \cdot 14.5}{f \cdot r_{th} \cdot 1 + (\lambda - 1)\eta_{sc}} \cdot C_{rel}$$

where  $f$  is the specific fuel consumption lb/bhp-hr,  $r_{th}$  the theoretical air-fuel ratio,  $\lambda$  the excess air factor and  $C_{rel}$  the relative charge in terms of displacement volume. The bmepl increases with the relative charge and with the scavenging efficiency. If we

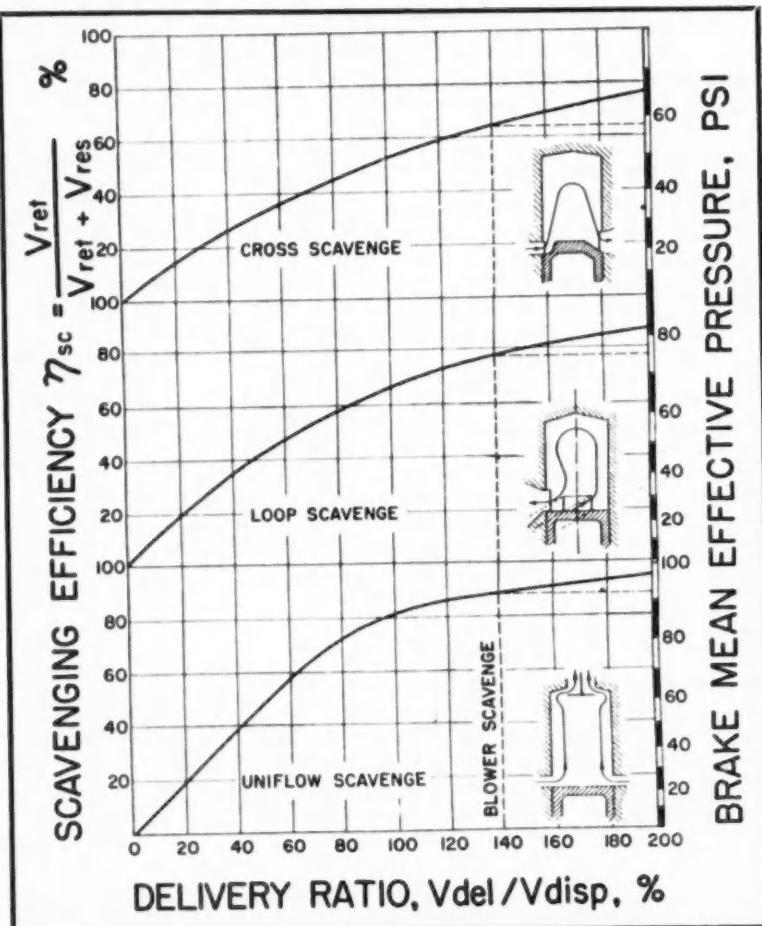


Fig. 1—Comparison of cross, loop, and uniflow scavenging.

ENGINE DESCRIPTION	BORE & STROKE (in.)	NO. OF CYL.	DISPL. VOL. (CU IN.)	RATED RPM	RATED HP (CONT.)	BMEP AT RATED RPM (PSI)	MAX. BMEP AT SPEC. RPM	HP PER CU IN. DISPL.	DRY WT. (LBS.)	SPEC. WT. LB/H.P.	HEIGHT LENGTH (IN.)	SPACE REQ. (CU FT.)	HP PER CU FT.	S.F.C. AT RATED HP LB/BHP/HR	BEST FUEL CONS. (PT LOAD)
FODEN FD6 ALUM. UNIFLOW	3.35 4.73	6	250	2000	126	100	106 1200	0.305	1100 <sup>(2)</sup>	8.73	39.25 53.75 29.67	37.0	3.33	0.41	0.398
SÜDWERKE C.I. UNIFLOW	4.53 5.52	4	354	1700	145	95.3	99 1150	0.41	1540	10.6	45.8 45.7 26.2	35	4.15	0.44	0.385
COVENTRY KF C.I. UNIFLOW	2.87 4.12	4	1071	2000	50	93	101 1400	0.466	622	12.4	34.12 36.12 24.25	17.4	2.87	0.49	
KHD DZ 70 <sup>(1)</sup> LOOP-SCAV.	6.3 6.3	16	3150	2670	1760	83	105 2200	0.56	2860	12.8	37 80 53	91	19.3	0.4	0.34
KRAUSS-MAFFEI KM6 C.I. LOOP-SCAV.	4.73 5.12	4V	360	2200	145	72	77 1700	0.403	1579	10.9	44 35 36	32	4.53	0.38	0.343
GRAF & STIFT 62T ALUM. LOOP-SCAV.	4.73 5.51	6V	580	2000	185	63.2	71 1400	0.319	1530	8.3	47 36.4 39.6	39.2	4.72	0.39	0.38
SAURER ALUM. LOOP-SCAV.	4.24 5.51	4	326	2000	140	85		0.43	1190	8.5	33.5 38.4 27.1	21.35	6.56		
ATLAS IRON. LOOP-SCAV.	3.54 5.12	4	201	1000	40	80	85 1400	0.20 0.32						0.47	0.41 0.37

(1) AIRCRAFT EXPERIMENTAL

(2) LESS ELECTRICAL EQUIPMENT

Table I—European Two-Stroke Automotive Diesels.

assume  $f = 0.4$ ,  $r_{th} = 14.5$ , and  $\lambda = 1.6$  which are good average values,

$$bmeep = 180 \frac{\eta_{sc}}{1 + 0.6\eta_{sc}} C_{res}$$

$C_{res}$  depends on the pressure and temperature of the charge trapped in the cylinder. Its value ordinarily is not far from 0.9 in "non-symmetrically scavenged" engines as most uniflow engines are, and 0.75 in "symmetrically scavenged" engines as most loop-scavenged engines are. When both inlet and exhaust are piston-controlled we have symmetrical scavenging as the port opening angles are symmetrical relative to bottom center. When the exhaust is valve controlled, it can be closed earlier and some supercharge effect achieved.

The scavenging efficiency itself varies with the delivery ratio and with the scavenging arrangement, as shown in Fig. 1. Cross-scavenging is the poorest as considerable amount of short-circuiting is involved. Fresh air blows through the cylinder without driving out residual gases. Loop-scavenging pioneered by Schnürle and Curtis is much better and uniflow scavenging is the best.

With 140 per cent delivery ratio which is a good average figure for blower-scavenged engines the respective bmeep's are 58, 75 and 92 psi for cross-, loop-, and uniflow scavenging respectively.

The 20 per cent lower bmeep represents a serious disadvantage for the loop-scavenged engine. Are there enough compensations to make it attractive in spite of this shortcoming?

Let us examine first how the reduced bmeep affects the weight and bulk of the loop-scavenged engine. In

Table I the principal dimensions, weights, and power output of the engines mentioned are tabulated. The first three are uniflow, the rest loop-scavenged. Some are aluminum, others cast iron. Some are in-line, others vee engines.

Comparing the bmeep's of these engines we find that the average for the loop-scavenged engines is indeed some 22 psi lower. But their horsepower output per cu ft space is, if anything, higher than those of the uniflow engines.

We don't have to search hard to find an explanation for this apparent anomaly. In the first place, the rotational speeds of the loop-scavenged engines are somewhat higher because of the absence of poppet valves. More important, the loop-scavenged engines have no camshafts, pushrods, rocker arms, valves and cylinder head covers. These components have weight and they increase the bulk of the engine without affecting its cylinder displacement. The result is that on the hp/cu in. displacement basis the uniflow engines are higher but on the hp/cu ft volume basis they are lower. If we worship the bmeep we should not use two-stroke cycle engines at all but supercharged four-stroke cycle en-

gines. But the driver and the vehicle owner pay little attention to the bmeep. They want most power in the smallest package. Apparently the loop-scavenged engine has it.

By the same token the loop-scavenged engines have the greatest simplicity. The elimination of the valves, valve gear and upper lubrication reduces the number of moving parts to an absolute minimum which simplifies manufacture and service, and lowers friction horsepower.

H. Desmond Carter called attention to the paradox that the engine which is by far the simplest mechanically has been the most complicated to design and develop. To which Sir Harry Ricardo replied: "The loop-scavenged Diesel engine in the past has suffered terribly by persecution by the novice . . ." He himself "had not been enough of an amateur to be seduced by its apparent simplicity or enough of an expert to face its formidable problems." That was in 1946 and since then the most significant developments in small loop-scavenged engines have taken place.

Perhaps the loop-scavenged automotive Diesel is not a step backward after all, but a step forward toward compactness and simplicity.

## Dearating Cold Weather Oil Systems

By F. E. Carroll, Jr.  
United Aircraft Products, Inc.

THE solution to the cold weather oil system problem has been determined to be the use of an automatic, mechanically operated diverter-

segregator valve in combination with a specially designed "heat transfer" hopper.

Simultaneously, in late 1949, a

valve design incorporating positive segregation was presented by U.A.P. to the USAF, and an oil decongealing demonstration of a "heat transfer" finned hopper at -65 F was made. During the winter of 1950-1951, the system in principle was tested in Alaska and satisfactory results obtained on a Grumman, Arctic Rescue SA-16 aircraft. These results gave further impetus to the project so that by early 1952, the diverter-segregator finned hopper oil system development was completed.

In general, a finned hopper weighs more than the standard oil system hopper. Further, recent experience has shown the installation problems presented by aircraft manufacturers and the USAF for the system are for retrofits on existent tactical aircraft. Retrofitting involves discarding the sump and hopper now installed and replacement with a sump adapter, a finned hopper and adding a hopper filler tube.

However, in some cases it is impossible to insert a finned hopper in existing tanks. Therefore, to obtain a lighter hopper and an adaptable design for retrofit on aircraft already produced, a further development of the hopper was initiated. Now completed, the result is the double wall or finless hopper.

In using the finned hopper, a considerable amount of surface was used to effectively transfer heat. The heat from the oil transferred through the fins rapidly melts the frozen makeup oil. The finless hopper design shown consists of one hopper being placed inside a larger diameter hopper. A

space is left between the two and held constant by spacers. The "to hopper" tube is connected to the annulus between the hoppers and the "to tank" line is routed on the side of the outer hopper as before. To obtain effective heat transfer with the finned hopper, considerable fin area was used. To

obtain the heat transfer and as it will be proven, improved heat transfer from the finless hopper, the velocity of the effective heated oil is increased past the metal adjacent to the frozen oil, thereby considerably increasing the oil film coefficient, and hence the heat transfer coefficient.

## Occurrence of Preignition in Present-Day Cars in Normal Service

By R. F. Winch  
Sun Oil Co.

**I**N studying 30 borrowed cars, ratings were obtained in the "as received" condition. The mileages varied between 200 to 27,000 miles so that combustion chamber deposits were not consistent. The cars had been run on various fuels and lubricants and in widely varying kinds of service.

The data indicate that preignition is indeed a significant and serious problem. It was present in varying degrees in almost all of the 30 cars tested. Fig. 1 shows the speeds at which preignition occurred on 87.5 octane reference fuel. The scale on the abscissa is engine speed with zero at the top and 2500 rpm at the bottom. The height of the bar then indicates the range of the preignition.

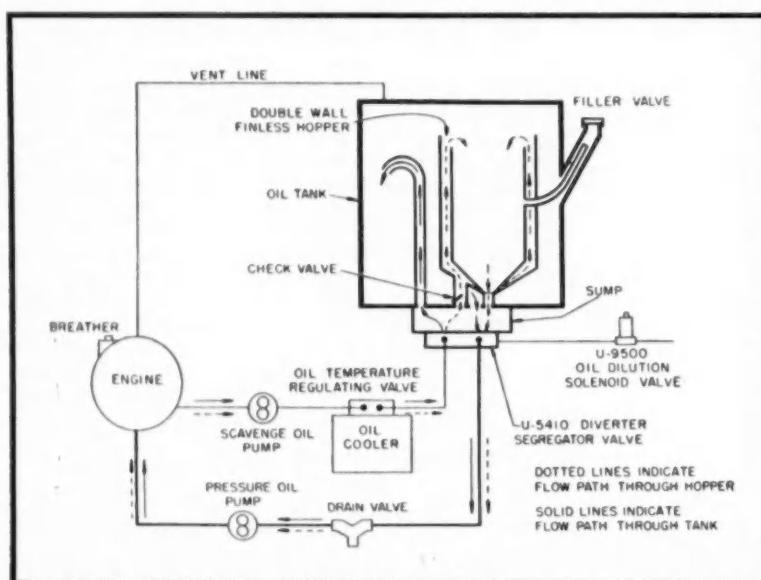
The cars have been arranged by makes in the order of the severity of their preignition tendency on this fuel. Of the nine different makes of 1952 cars tested, preignition was de-

tected in eight of them. However, there is a considerable spread in the resistance demonstrated by the different makes. Some of them, Car B, for instance, were preigniting almost as soon as the throttle was opened, while neither of the cars of make I showed any preignition difficulty at all on this fuel. In a few cases, there were wide differences in preignition tendency of two cars of the same make such as makes D, E, and F. This is not too surprising since none of the cars were in the same combustion chamber condition; they had not been driven in the same type of service, nor with the same fuels and lubricants.

Because of the transmission characteristics of Car A, it was not possible to get a rating of the engine at speeds below 1700 rpm. As soon as the throttle was opened fully, engine speed went right to 1700 rpm. Preignition was present at this speed and was severe enough to indicate it would have been present at much lower speeds. For this reason it is placed as the most severe of the group.

The 1953 cars tested were, in some cases, improved over the 1952 models, Fig. 2, while others were noticeably worse. An actual comparison of the level of the 1953 model of Car A with the 1952 model cannot be made because of the transmission, but from observation, it is obviously in more trouble than is the 1952 model. Car H, a mild car in 1952, is apparently joining the ranks of the problem cars.

The knocking and wild ping tendencies of the 1952 cars are shown in Fig. 3. Here the cars are arranged in the same order as they were in Fig. 1. The cross hatched bars indicate the octane number of the fuel necessary to prevent detonation while the solid bars represent the octane number of the fuel necessary to prevent wild ping. It was found that cars with the highest preignition tendency in most



The deicing cold weather oil system.

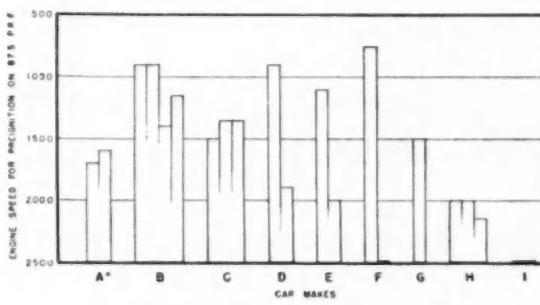


Fig. 1—Preignition tendency of some 1952 cars.

cases were also highest in octane requirement. Make C is apparently an exception. The octane requirements for these cars are lower than the average for both knock and wild ping. With one car of this make there was no wild ping present at all. With some of the cars of makes A, B, and E, the wild ping ratings are as high as the knock ratings. As previously mentioned, this suggests that preignition in the form of wild ping, and not just detonation, is dictating the octane level of the fuel necessary to satisfy these particular engines.

There was a very large spread in the ratings obtained with the 1953 cars. As shown in Fig. 4, the rating of Car A was exceptionally high and, with one car, definitely limited by wild ping. Car H was shown to have a higher preignition tendency in 1953 than it did in 1952. The octane requirement is also a lot higher in the new model. Both cars of make H were in considerable wild ping difficulty. The other 1953 cars were relatively mild, makes K, C, and F showing no wild ping tendency at all.

The same 30 cars were also evaluated using a typical commercial premium type fuel. Nearly all of the

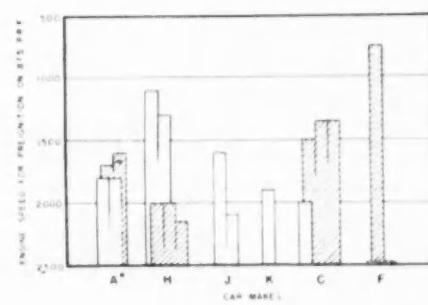


Fig. 2—Preignition tendency of some 1953 cars. Shaded bars are 1952 model data from Fig. 1.

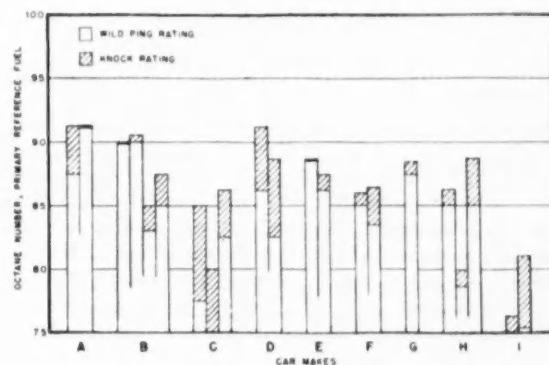


Fig. 3 — Knock and wild ping rating of some 1952 cars.

cars had some preignition occurring with this fuel, and over 50 per cent were knocking. Wild ping was occurring with 45 per cent of the cars run on this fuel. For this particular 45 per cent, preignition is a very real problem, a problem that is now reach-

ing the ears of the driver in the form of wild ping. From the results described herein, the old solution for preventing audible knock—octane numbers—is known to be rather ineffective in solving the basic preignition problem.

## Deposit-Induced Ignition

By D. A. Hirschler, J. D. McCullough and C. A. Hall  
Ethyl Corp.

DEPOSIT-INDUCED ignition is one of the problems hindering the development of higher compression, more efficient engines. Deposit-induced ignition results in uncontrolled combustion which often is followed by knock. In some modern engines, the suppression of knock originating through this mechanism may require higher fuel antiknock quality than that required to suppress ordinary knock.

A deposit-ignition counter was developed which, in conjunction with an ionization gap, would automatically detect uncontrolled combustion arising from ignition by the deposits and would differentiate it from normal combustion. This instrument also incorporated means for recording a cumulative total of the engine cycles in which deposit ignition occurred.

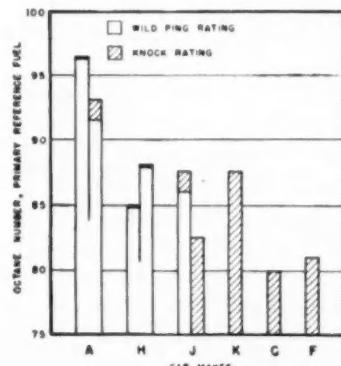


Fig. 4—Knock and wild ping rating of some 1953 cars.

Differentiating between normal and uncontrolled combustion was accomplished by making the counter operate only during a selected portion of the engine cycle before the normal flame front arrived at the ionization gap. Fig. 1 illustrates this portion of the cycle.

It has been pointed out that the spark-ignited flame front arrived at the ionization gap in the test engine at 15 to 18 deg after top dead center. As shown graphically in Fig. 1, the counter was controlled to record the occurrence of flame fronts at the ionization gap during the period from 70 deg BTC to 10 deg ATC. Since it was rendered inoperative after 10 deg ATC, the normal spark-ignited flame fronts were not counted. The five-deg interval between cutoff of the

(Turn to page 128, please)

# United Nations' Study of Motor Vehicle Industries

by David Scott

LONDON, ENGLAND

"RECENT reports from automobile manufacturers point to the fact that, at present prices, the market in Europe . . . is reaching the saturation point." Given the present framework of the European automobile industry, "there is no reason to believe that demand will grow to any great extent. Production can therefore be expected to remain much at the same level or at best grow at only a slow rate."

This is one of the main observations in an analysis of the world vehicle industry which is included in a study of the European steel industry recently prepared by the United Nations Economic Commission for Europe. This document is concerned with production

and consumption trends in flat steel products, and particular attention is given to the automobile industry since it is the leading end-user of them.

It deals initially with trends in vehicle production and sheet steel consumption in the seven countries which account for 90 to 95 per cent of the world's output of passenger cars, trucks and buses: the United States, Britain, Russia, Canada, France, Western Germany and Italy. Vehicles in circulation are covered in some detail, and the close link between income levels and the number of inhabitants per vehicle is established. The text is buttressed with fifteen tables relating vehicle production and stocks to roads, railways, exports, taxation, population and national income in a number of countries. Some of these are presented in abridged form in these pages.

The study embarks on a critical survey of the European vehicle industry, dealing first with the prospect of increased demand. While recognizing that the proportion of prewar cars now in use in Western Europe is generally very high, it doubts whether much reliance can be placed on a substantial abnormal replacement demand. The problem presented is what measures might be taken to bring about an expansion of the industry.

Greater demand, it maintains, can be stimulated in several ways by governments. Expansionist policies designed to raise national incomes may be adopted, discrimination in favor of road transport rather than railways may be practiced, there can be more expenditure on extending and improving highways, and passenger motor transport can be encouraged.

But the main task lies with the industry itself, and the need for more efficient and economical designs and production methods are stressed. "It is clear," the study points out, "that the simplest type of car in the market in Europe today is well outside the reach of those who could afford such a car before the war. This represents an abrupt reversal of the trends between the wars which moved towards the tapping of new layers of demand at successively lower income levels each year." It calculates that in terms of the average industrial wages in the U. S., France, Britain, and Western Germany, a Chevrolet, Renault, Morris Minor and Volkswagen are equivalent respectively to

## WORLD PRODUCTION OF MOTOR VEHICLES

(in thousands of units)

	1937		1950		1952‡	
	Pass.	Comm.	Pass.	Comm.	Pass.	Comm.
United States	3916	893	6666	1337	4321	1218
Canada	153	54	285	106	298	154
Total North America	4069	947	6951	1443	4619	1372
France	177	24	257	100	361	132
Western Germany*	264	64	216	90	295	125
Italy	61	10	101	27	111	24
United Kingdom	390	118	522	263	432	237
Total four leading West European producers	892	216	1096	480	1199	518
Soviet Union	18	182	66	434		
Grand Total	4979	1345	8113	2357		

\* 1937 figures apply to the whole of Germany.

† Plan figures.

‡ Based on production of first nine months, except for U. S. and Canada which are for entire year.

6, 17, 13 and 13 months' wages. The corresponding prewar figure for a Morris Minor in Britain was seven.

Specific recommendations directed at the European industry as a whole are: more effort towards standardization of parts and components; interchangeability of these between models; and the reduction of the number of types, with a view to producing each model on a sufficiently large scale to obtain efficient production.

In connection with the last point, the study notes that the British Manufacturers' Advisory Council has established the figure of 100,000 annually as an economic scale of output for a given model, while American engineers have put it at 250,000. Current rates of output for individual types in Europe are much lower, however, and the only exceptional cases are the Volkswagen and the small Renault (whose current rate of output is 100,000).

The general practice of European manufacturers to buy components and parts outside is criticized, particularly since this accounts for more than half the total production cost. It emphasizes that in the U. S., while components are made by specialists, the companies making them are in the main controlled by the big automobile firms.

The study reports that there has been some improvement in Britain since the war, especially in electrical equipment. For example, 48 types of generators, 38 starter types, 68 distributors and 18 battery sizes have all been reduced to three of each, while 133 headlights

and 12 ignition coils have each been cut down to three types. In the period after the war, considerable progress was made towards standardization and reduction of automobile models, and in 1948 Britain exhibited only 48 types of cars at the November motor show as compared to 136 produced in 1939.

Since then, however, there have been signs of slipping back to the prewar pattern. The Austin-Nuffield merger has not so far resulted in a decrease of models made by this group, and competing cars in the same price and weight range are still being turned out. New automobiles in the luxury and sports range continue to be produced, and "the general trend has been towards a larger, faster and heavier car costing rather more to run." In the low-priced field there has been little change in performance and gasoline consumption, the study comments; "trends are undoubtedly all in the direction of a better article judged purely as a motor car, but they appear to be moving steadily away from the sort of car which is simple enough and cheap enough to cater for a mass market."

The general conclusion which emerges is that a big increase in demand for automobiles both at home and abroad can be expected to follow a policy of concentrating primarily on three types of passenger cars:

1. A really cheap, small, popular car, economical to operate and in the price class of \$560 to \$700. The Volkswagen and austerity Citroen are cited as steps in this direction.

2. A large and more rugged vehicle, also simple and economical to run, and capable of tackling primitive

## GROWTH OF WORLD STOCK OF MOTOR VEHICLES

(in thousands of units)

	1938		1952	
	Motor Vehicles	Persons Per Motor Vehicle	Motor Vehicles	Persons Per Motor Vehicle
EUROPE	9065	67	12375	49
Western Europe	8225	40	10279	32
Eastern Europe	162	560	296	306
Soviet Union	678	285	1800	107
OCEANIA	1129	11	2049	6
AMERICA	31426	10	56314	6
United States	29212	5	51426	3
Canada	1381	10	2809	5
Latin America	833	195	2079	78
AFRICA	656	302	1290	153
ASIA (excl. USSR)	667	1876	1121	1116
China	45	10300	53	8745
Grand Total	42943	56	73149	33

## PRODUCTION AND EXPORTS OF MOTOR VEHICLES

(in thousands of units)

	1950			1951		
	Production	Total Exports	Per Cent Production Exported	Production	Total Exports	Per Cent Production Exported
France	357	117	33	446	125	28
Western Germany	306	83	27	374	120	32
Italy	128	22	17	145	32	22
United Kingdom	785	544	69	735	506	69
Total four leading West European producers	1576	766	49	1700	783	46
United States	8003	252	3	6768	433	6
Canada	391	34	8	413	60	15
Grand Total	9970	1052	11	8881	1276	14

roads. Such a car might be "the natural descendent of the model T Ford," and examples are the British Land Rover and the new Austin Champ.

3. A large, mass-produced automobile, directly competitive with the standard American car in the low or even medium price class. The Jaguar Mark VII is mentioned as one of the models which is beginning to compete seriously in this field.

If three such types of car were turned out on a really large scale, the study concludes, "the outlook for the European motor industry would probably be transformed." It does not argue that this should be at the expense of the whole existing range of European models, but that a radical reduction in the number of other types available should be effected.

In assessing the future of export markets, it is shown that the growing tendency towards the local assembly of imported parts is a new factor which should be taken into account. Canada, Argentina and Brazil have assembly plants, and Australia is now producing cars as well as assembling them. In India, a replica of the British Morris is now being made on a small scale.

It is significant, the study stresses, that such countries as Austria, Belgium and Switzerland, which previously manufactured complete automobiles, now confine themselves to importing virtually all the parts. Large producers in Europe and the United States are paying increasing attention to local assembly and are establishing plants in several countries. Whether this general tendency will prove detrimental to European exporting interests, it feels, depends primarily on the degree to which major European manufacturers are prepared to set overseas assembly units.

## EXPORTS OF MOTOR VEHICLES 1950 AND 1951

(in thousands of units)

### EXPORTING COUNTRIES

Importing Regions	North America		Europe				
	Canada	United States	United Kingdom	France	Western Germany	Italy	Total Europe
PASSENGER CARS							
1950							
Latin America	1.0	63.4	20.9	5.0	2.4	0.8	29.1
Asia	0.4	9.1	25.8	3.7	0.3	2.3	32.1
Africa	6.2	10.3	33.6	26.6	4.1	1.7	66.0
Oceania	15.9	1.0	142.3	3.9	—	0.9	147.1
Total	23.5	83.8	222.6	39.2	6.8	5.7	274.3
1951							
Latin America	6.2	116.9	23.2	7.0	8.4	1.3	39.9
Asia	2.8	21.8	41.0	5.3	1.5	4.3	52.1
Africa	8.0	17.2	45.3	31.5	8.8	2.6	88.2
Oceania	16.0	2.2	140.8	7.9	0.4	2.3	151.4
Total	33.0	158.1	250.3	51.7	19.1	10.5	331.6
COMMERCIAL VEHICLES							
1950							
Latin America	0.2	86.7	13.1	2.0	2.3	0.1	17.5
Asia	1.6	17.5	12.3	1.1	0.2	0.1	13.7
Africa	1.9	12.5	20.6	16.3	0.3	0.4	37.6
Oceania	6.5	1.7	55.3	0.1	0.1	—	55.5
Total	10.2	118.4	101.3	19.5	2.9	0.6	124.3
1951							
Latin America	9.9	134.6	12.8	4.1	6.6	1.2	24.7
Asia	1.9	35.1	14.7	1.8	0.5	0.1	17.1
Africa	4.5	21.9	22.9	19.0	2.1	0.4	44.4
Oceania	6.3	1.8	46.4	0.5	0.6	0.3	47.8
Total	22.6	193.4	96.8	25.4	9.8	2.0	134.0

## Magnesium and Resin

### Dealt With in Latest

### SHELL MOLD DEVELOPMENTS

#### Selecting a Resin for Shell Molds

By Manuel F. Drumm

Monsanto Chemical Co.

For the shop which is an automatic shell mold production, the evaluation of a prospective shell mold binder may be accomplished according to the following schedule, without interfering with production with a "blind" run:

1. Choose a standard sand, one which is representative of the sand used on the shell molding job.
2. Prepare several small mixes at various resin contents. This will allow determination of the optimum resin concentration.
3. Using the mixtures prepared in (2), make flexural and/or tensile measurements. Molding conditions should be comparable to those which the resin will be subjected in production.
4. Compare these results with those obtained on the resin being used in production.
5. If strength properties are considered adequate, choose the optimum resin concentration and run tests for "shell thickness," "peeling," "hot rigidity," and "packing on vertical surfaces."
6. If the resin still performs satisfactorily, it may be tried in production on a limited scale with some confidence.

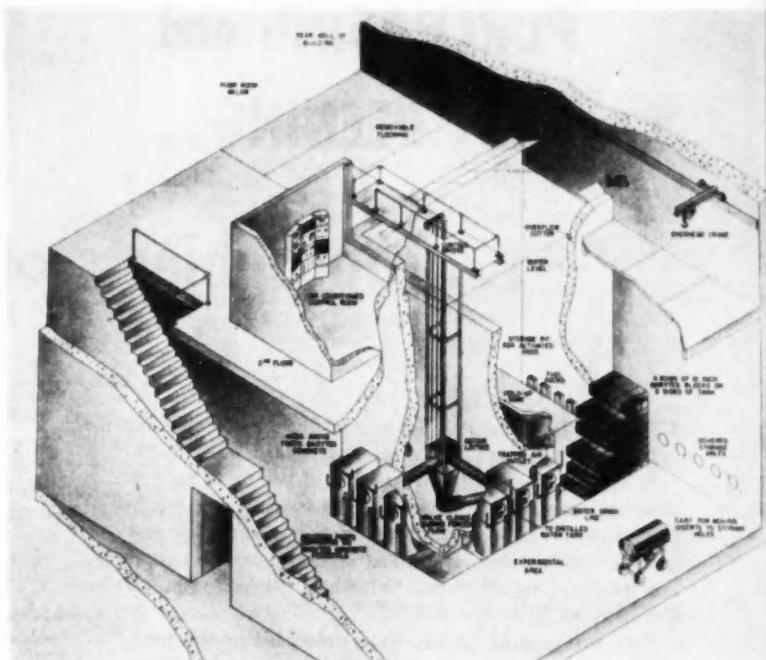
For the shop that is just entering shell molding  
(Turn to page 111, please)

# **Atomic Energy Pilot Plants**

**T**wo members of the automotive and aviation industries have announced plans for participation in atomic energy research.

North American Aviation, says chairman J. H. Kindelberger, is ready to build a pilot plant with which to "demonstrate and study the practical and economical aspects" of electrical power production by a nuclear reactor of this design. The \$10 million pilot plant would generate 8000 kw. This is one of several projects NAA has undertaken within this field since 1946. It built California's first reactor.

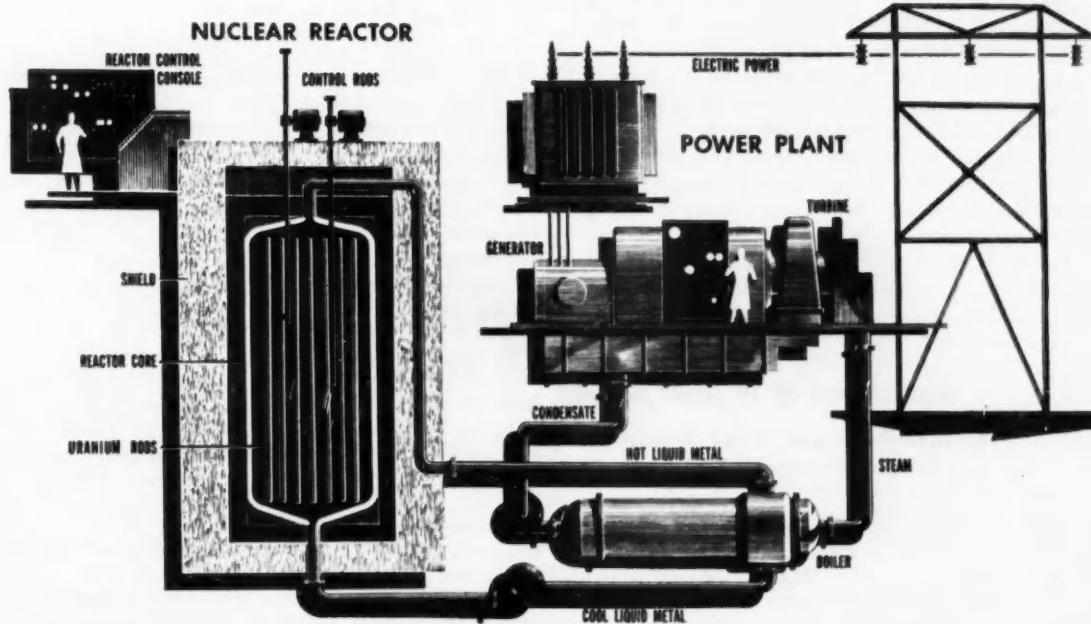
The University of Michigan's nuclear reactor will be built with a \$1 million grant from the Ford Motor Co. Fund. Basic research will be conducted in various fields such as medicine



#### **North American's proposed pilot plant.**

in this three-story structure to be attached to the Phoenix Memorial Laboratary, situated in Ann Arbor.

#### **Nuclear reactor to be built by University of Michigan.**



# PURCHASING and SHOT PEENING...

By Thomas Mac New

## ...Top Subjects of Gear Meeting

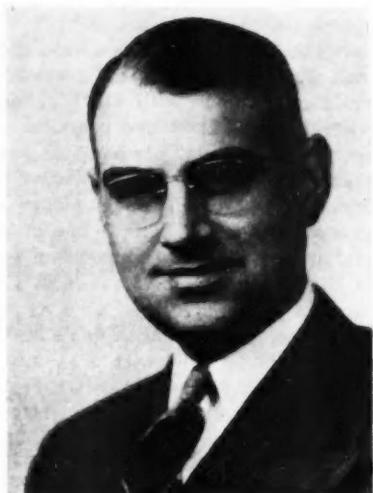
THIS year's Annual Meeting of the American Gear Manufacturers Association exceeded all expectations in respect to the number of people in attendance and the activity in the various meetings. A highlight of the four-day affair at Hot Springs, Va., last month, was the presentation of special awards to various gearing industry men who had served with the Government in recent months.

Two outstanding papers were presented at the technical sessions. A production paper, which has been extracted for this article, on the shot peening of gears was given by John C. Straub, chief research engineer, American Wheelabrator & Equipment Corp. The other presentation concerning an analytical approach to purchasing was prepared by Andrew M. Kennedy, Jr., assistant general manager of purchases, Westinghouse Electric Corp.

Mr. Kennedy stated that purchasing agents should make four decisions when buying a product. These are: product quality, the quantity needed, delivery time, and then the price. According to the speaker, a great deal of cost reduction is up to the purchasing agent and that he should analyze the product and classify it by volume to achieve this goal. As a matter of interest, he stated that 350 buyers at Westinghouse purchase \$700 million in goods each year.

Officers elected by the Association for the fiscal year 1953-54 were installed at the meeting. They include: President—George H. Sanborn, sales manager, Fellows Gear Shaper Co., Springfield, Vt.; Vice President—R. B. Holmes, general manager Philadelphia plant, Link-Belt Co.; Treasurer—Fred R. Eberhardt, president, Eberhardt-Denver Co. Newly elected mem-

George H. Sanborn, sales manager, Fellows Gear Shaper, has been elected President of the AGMA for 1953-54.



bers to the Executive Committee include: E. C. Denne, consultant and manager, Gear Dept., United Engineering and Foundry Co., Pittsburgh, Pa.; Thomas A. Jones, president, W. A. Jones Foundry and Machine Co., Chicago, Ill.; R. E. Smallwood, project engineer, Dominion Engineering Co., Ltd., Montreal, Canada; and Raymond B. Tripp, executive vice president, Ohio Forge and Machine Corp., Cleveland, Ohio.

An extract of Mr. Straub's paper on shot peening follows:

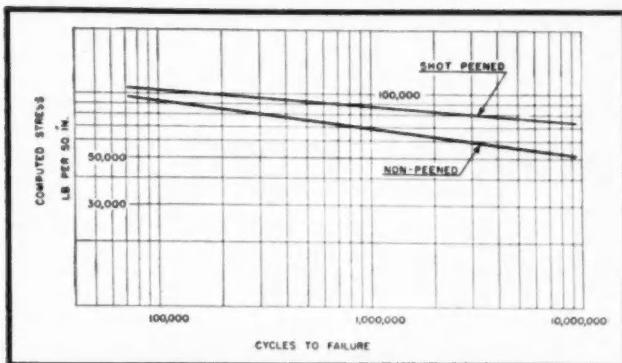
### Shot Peening in Gear Design

By John C. Straub, Chief Research Engineer  
American Wheelabrator & Equipment Corp.

WHEN shot peening is considered in the design of a pair of gears, one of the first questions which arises is "How much increase in the allowable bending stress can be obtained by the process?" This

is not a constant value, but depends upon the order of magnitude of the working stresses involved. Or, to put it another way, it will depend upon the required useful life of the gears at maximum load. Fig. 1 shows an

SN diagram for carburized and hardened automotive type spur and helical gears. The lower line shows the relationship between computed bending stress and average life for non-peened gears, and the upper line, for shot peened gears. It will be observed that these lines tend to converge at the left of the chart where the stress is high and the life correspondingly short. Actually, if the two lines were projected to the left, that is toward



**Fig. 1 —**  
Fatigue chart of carburized automotive type spur and helical gears, shot peened and non-peened.

the region of static failures, the two lines would intersect. In other words, shot peening is not effective in increasing the static strength of the material, but becomes increasingly effective as the required useful life is increased. Referring to the chart, at a life of 100,000 cycles the increase in allowable stress due to peening is about 10 per cent. However, at a required life of 1,000,000 cycles, the increase in allowable stress is a little more than 25 per cent. Proceeding still further to the right, at a required life of 10 million cycles, the increase in allowable stress is close to 50 per cent.

It should be emphasized that the figures just quoted represent the increase in *allowable stress* for a given life, as distinguished from increase in life at a given stress. The increase in life at a given stress is much greater. For example at a stress of 80,000 lb/sq in. the increase in average life resulting from shot peening is approximately 1000 per cent.

It should be further emphasized that the chart shown in Fig. 1 does not represent the optimum that can be obtained by shot peening, but is representative of an average job with no attempt to achieve the best possible results.

In gears which are subject to fatigue failure due to bending stress, the maximum stresses are located at the tooth fillets. It might appear at first glance that the possibilities of reducing weight by shot peening are meager. This is not necessarily the case. For gears of similar geometry, the maximum bending stress in the tooth fillet will vary inversely as about the cube of the pitch diameter, or the cube of the center distance. A decrease in center distance, of course means that the size of the entire housing can be decreased in proportion.

The weight of a spur of helical transmission will vary approximately as the cube of the center distance, other conditions being constant. This means that, in cases where bending strength is the controlling factor, if the allowable bending stress is increased, the weight of the unit can be reduced in the same proportion.

For example, if the required life under maximum load conditions is in the neighborhood of 100,000 cycles, by referring to Fig. 1, it can be seen that the allowable stress can be increased by 10 per cent. This would result in a decrease of 10 per cent in the weight of the entire unit. For a required life of one million cycles at maximum load, the increase in allowable stress is 25 per cent which would result in a decrease of 25 per cent in the weight of the assembly. These estimates of course are based upon the assumption that other parts in the assembly are not so critical that the potential reduction in size of the unit is limited by such members.

The fact that shot peening is most commonly used as a means of increasing fatigue strength in bending or torsion does not mean that the process should be ignored in a gear design which may be subject to scoring. Data available indicate that shot peening has little direct influence on scoring or pitting. However, when we consider the overall design of a pair of gears, it will be recognized that bending strength sometimes conflicts with scoring resistance. For example, a coarse pitch is favorable for bending strength because of the greater thickness at the root of the tooth. However, due to the greater tooth height necessary for adequate tooth contact ratio (assuming the same pressure angle), tooth action will take place closer to the base circle, with a consequent decrease in the radius of curvature. This results in a

higher compressive stress both at the beginning (or end) of action, and at the highest point of single tooth contact. Also, due to the greater tooth height as well as greater normal pitch, the sliding velocity will be greater with a coarse pitch than with a fine pitch.

This leads to the conclusion that although a coarse pitch is favorable for bending strength, a fine pitch is favorable for scoring resistance. But if shot peening is considered in the design of the gears, it can be used to permit the use of a finer pitch for greater scoring resistance by providing the necessary increase in bending strength. Carrying this concept somewhat further, shot peening may be used to accomplish a decrease in size of the gears, even though the application may be more vulnerable to scoring than to bending failures, provided the design with peening is balanced for equal resistance to scoring and bending failures.

In cases of high ratio gears in which tooth action approaches the base circle of the pinion, the compressive stress might be very high because of the small radius of curvature in that region. This naturally suggests the use of long and short addendums, but even then the high compressive stress might present a problem. This condition again suggests the use of a finer pitch, which in the case of very high ratios may not permit a further decrease in the gear addendum, but it would permit a greater contact ratio for better distribution of the transmitted load. In more moderate ratios, in which pitting is more likely to occur just below the pitch line of the pinion, the benefit of a finer pitch would probably be less than in the case of high ratios, although it would result in a slight increase in contact ratio for full depth teeth.

The question sometimes arises whether there is a sufficient dimensional change due to peening to introduce errors in gear tooth profile. With proper peening procedure, there should be no significant change in profile, particularly in hardened gears. Some manufacturers have compared the noise level of peened gears against identical gears non-peened, and were unable to detect any difference in the noise level. At least one manufacturer insists that shot peened gears are quieter in op-

(Turn to page 104, please)

# Vehicle Production in Japan

## Continues at High Rate

### PRODUCTION

	1952*	1951	1950
Passenger cars.....	4,297	3,684	.....
Light trucks.....	9,720	8,222	.....
Standard trucks (1½-15 tons); buses.....	21,900	26,594	.....
	35,917	36,500	32,472
Three-wheel cycle trucks.....	39,984	43,817	35,521
Motorcycles.....	55,719	11,158	2,633
Motor scooters.....	26,568	12,836	4,953

Japanese fiscal year is from April to March.

\* For 11 months ending February 1953.

LATEST figures for the production of cars, trucks, and buses in Japan show a continuation of the high postwar rate established in 1951. Motorcycle production shows the greatest growth, followed by increases in the output of motor scooters, light trucks, and passenger cars.

Passenger car registrations totaled (August, 1952) about 60,000 with 20,000 privately owned by foreigners, mostly members of the U. S. Armed Forces. These latter are largely American postwar models, and provide the Japanese buyer with about his only opportunity to obtain American cars. No new foreign trucks are imported. The country has about 400,000 trucks and buses, of which 80,000 are Diesels, mostly of Japanese manufacture.

Internal demand for passenger cars (mostly taxis) for the next five years is variously estimated at 10-20,000 units annually. Exports have been negligible in the post-war period, largely because outmoded designs at high prices could not compete with European models.

Restrictions since the industry resumed production in 1947 have been caused mainly by the shortage of bodies. At present, bodies for passenger cars are hand made, mostly by former aircraft manufacturers. The Japanese "Big Three" passenger car makers state that they would order dies if each could be assured a market for 7000 cars annually.

Agreements between Japanese manufacturers and foreign makers have been concluded recently; how-



Toyopet four-door sedan, 98-in. wheelbase, five-pass., weight 2800 lb. Four-cyl. L-head, 61 cu in., engine, 28 hp at 4000 rpm. Four-speed transmission.



Datsun wagonette, 85-in. wheelbase, four-pass., weight 2050 lb. Four-cyl L-head engine, 53 cu in., 20 hp at 3600 rpm. Four-speed transmission.



**Hino 13-ton trailer truck, 136-in. wheelbase (tractor), chassis weight (both) 15,400 lb. Engine 662 cu in., six-cyl Diesel, 115 hp at 1800 rpm. Five-speed transmission.**

ever, Chrysler, Willys, Rootes Group, and Austin are having little success in meeting Japanese Government restrictions on money exchange and home industry protection policies. Kaiser-Frazer currently is the most firmly established, and depends heavily on exporting its Japanese product to Southeast Asia. First regular shipments of the four-passenger rear-engine Renault to Hino Diesel Industry have just begun. Body stampings from France are welded at Tokio. Hino, under a new seven-year contract, plans to develop its own production of mechanical parts. Present production capacity is 120 cars per month and public demand is said to exceed this.

Truck production is of greater importance to the Japanese industry, as seen from Table I. Makers of light trucks built on passenger car chassis have a greater backlog of orders to fill than do manufacturers of heavier models, and production is determined by the supply of bodies. Several jeep-type trucks of intermediate size, powered by six-cyl truck engines, are proving popular.

Standard-size trucks and buses are being produced at about two-thirds of monthly capacity. Production is subject to fluctuation, depending heavily on orders from the National Police Reserve, U. S. procurement, and commercial exports. U. S. orders have amounted to about 25 per cent of production since the Korean war, but are thinning out this year. About 18 per cent are Diesel powered. Commercial usage is increasing, particularly for perishables, as rail freight rates



**Toyopet light (one-ton) truck, 98-in. wheelbase, chassis weight 1700 lb. Four-cyl. L-head, 61 cu in., gasoline engine, 28 hp at 4000 rpm.**

## PRICES

*Approximate dollar equivalent prices are fob factory and include 20 per cent commodity tax.*

### TOYOTA

Toyopet four-door sedan .....	\$ 34 3600
Toyopet light truck chassis .....	\$ 1500
Four-ton truck chassis w/cab .....	\$ 2750

### NISSAN

Datsun sedans .....	\$ 27 2900
Datsun light pickup truck .....	\$ 1600
Four-ton truck w/platform .....	\$ 3200

### KOHOSOKU

Ohta two-door sedan .....	\$ 27 2900
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### ISUZU

Truck (Diesel) .....	\$ 3800
Five-ton chassis (Gasoline) .....	\$ 2800

### HINO

7½-ton Diesel truck chassis .....	\$ 5100
13-ton tractor and trailer .....	\$ 7500



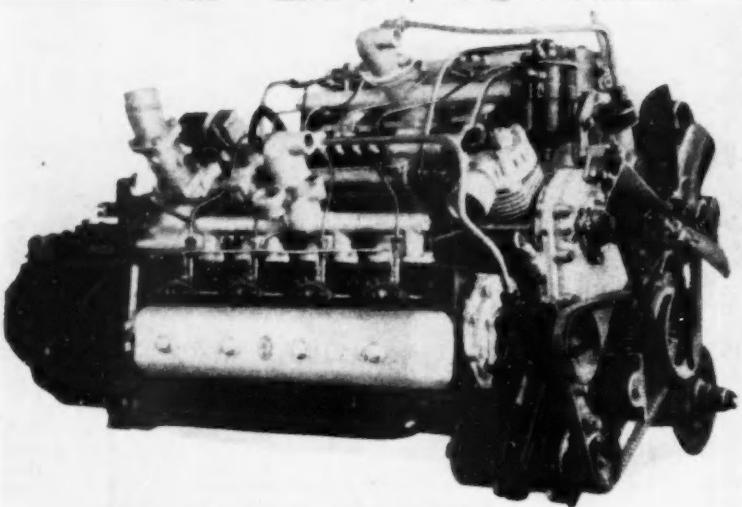
**Isuzu five-ton cargo truck, 158-in. wheelbase, chassis weight 5200-5800 lb. Six-cyl Diesel ohv, pre-combustion chamber type, 311 cu in., 90 hp at 2600 rpm, or six-cyl L-head gasoline engine, 268 cu in., 90 hp at 2800 rpm. Four-speed transmission.**



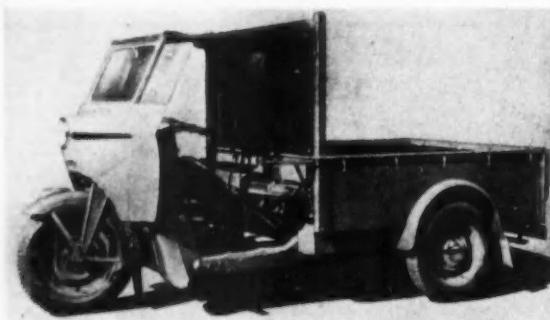
**Toyota four-ton cargo truck, 158-in. wheelbase, chassis weight 4400 lb. Six-cyl ohv gasoline engine, 207 cu in., 82 hp at 3000 rpm.**

increase and gasoline becomes more plentiful. The trend is toward private carrier operation as against the prewar for-hire practice. Truck export, although only about four per cent of present production and falling recently, is expected to increase. Markets in the Ryukyu Islands, Taiwan, Thailand, the Philippine Islands, Australia, Argentina and Brazil have been opened since the war.

Truck builders would like to tie up with U. S. firms under a patent licensing and technical assistance arrangement. Toyota and Nissan, two of the three passenger car builders, each control about 45 per cent of the light truck market and about 38 per cent of the standard truck field. But some industry observers feel that if these firms make agreements with English and Continental passenger car makers,



**Isuzu Diesel V-8 ohv pre-combustion chamber type, 415 cu in., 117 hp at 2600 rpm.**



**Typical one-ton, three-wheel truck. Wheelbase 89 in., chassis weight 1750 lb. Aircooled two-cyl, four strokes, 90 deg V engine, 61 cu in., 26 hp at 4000 rpm. Three-speed, sliding gear transmission, Hotchkiss drive.**

U. S. manufacturers, at least the car makers, would be reluctant to work with the same firm for the production of trucks.

Parts makers, about 300 strong, experienced rapid growth in the postwar period. Production in 1952 is believed to have been higher than the 1951 record \$30 million. A portion of a government subsidy for research and promotion of the industry, from automobile racing taxes, was used to assist small parts makers.

The midget automobile industry has been enjoying a boom for several years with no sign of abatement. The three-wheeled truck is replacing the oxcart in many areas; some machines are rated at nearly two tons capacity. Eight companies, some with production capacity of 2000 units per month, make these ma-

chines. Three are veterans of prewar production, while three others converted from aircraft manufacture. Aircooled, four-stroke single and twin cylinder V and inline engines are most common. They range from 38 cu in. and 19 hp to 70 cu in. and 40 hp. Special vehicles include fire trucks, dump trucks, delivery vans, closed cars, a 220-gal tank truck and a tracklaying type truck. Total registrations are now over 200,000. Exports have been negligible so far.

Motorcycle and motor scooter production has increased the fastest since the war. Where three firms made a few motorcycles prewar, nearly one hundred now manufacture components or assemble units. Total registrations now are over 180,000. Cycle engines, for attachment to the many bicycles in use in Japan, also are made in substantial numbers; production capacity is said to be over 150,000 cycle engines per year.

Modernization of the entire industry is a prime need. Investment funds are lacking despite highest profits since the war and substantial increases in capitalization. The shortage of funds is ascribed to the use of available funds for financing; it is reported that only manufacturers are able to obtain loans for this purpose. Usual terms for cars and trucks are one-third down and the balance in six months.

### New Planes

Details of the Lockheed C-130 assault transport have been released by the company. The high-wing cargo plane will be powered with turbo-propeller engines, and will operate at twice the altitude of most present airline transports. Construction features include extensive use of machined panels, and landing gear attached at fuselage instead of at engine nacelle.

Although Douglas Aircraft Co. has spent over one million dollars on the preliminary plans for its DC-8 jet transport, no immediate production schedule is in prospect.

# SCHWITZER-CUMMINS COMPANY

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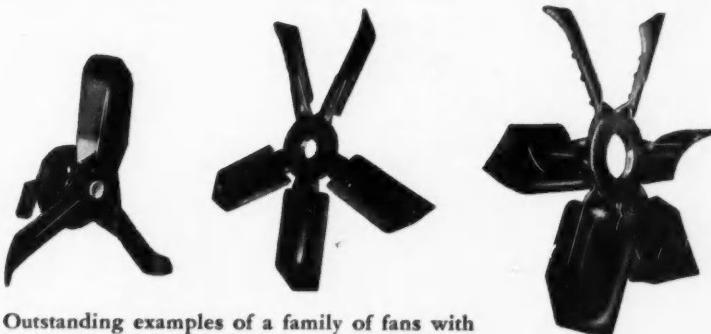


For over a third of a century we have been suppliers of cooling fans to the automotive industry; in many cases the chief supplier to whole divisions within the industry. For instance, today practically all leading engines in the fast growing Diesel field carry Schwitzer-Cummins fans along with other Schwitzer-Cummins products.

Pictured at the left is a 40" diameter heavy duty fan

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We will apply the experience and skill of a lifetime of building and engineering cooling fans to your problem. We'll appreciate your inquiries.

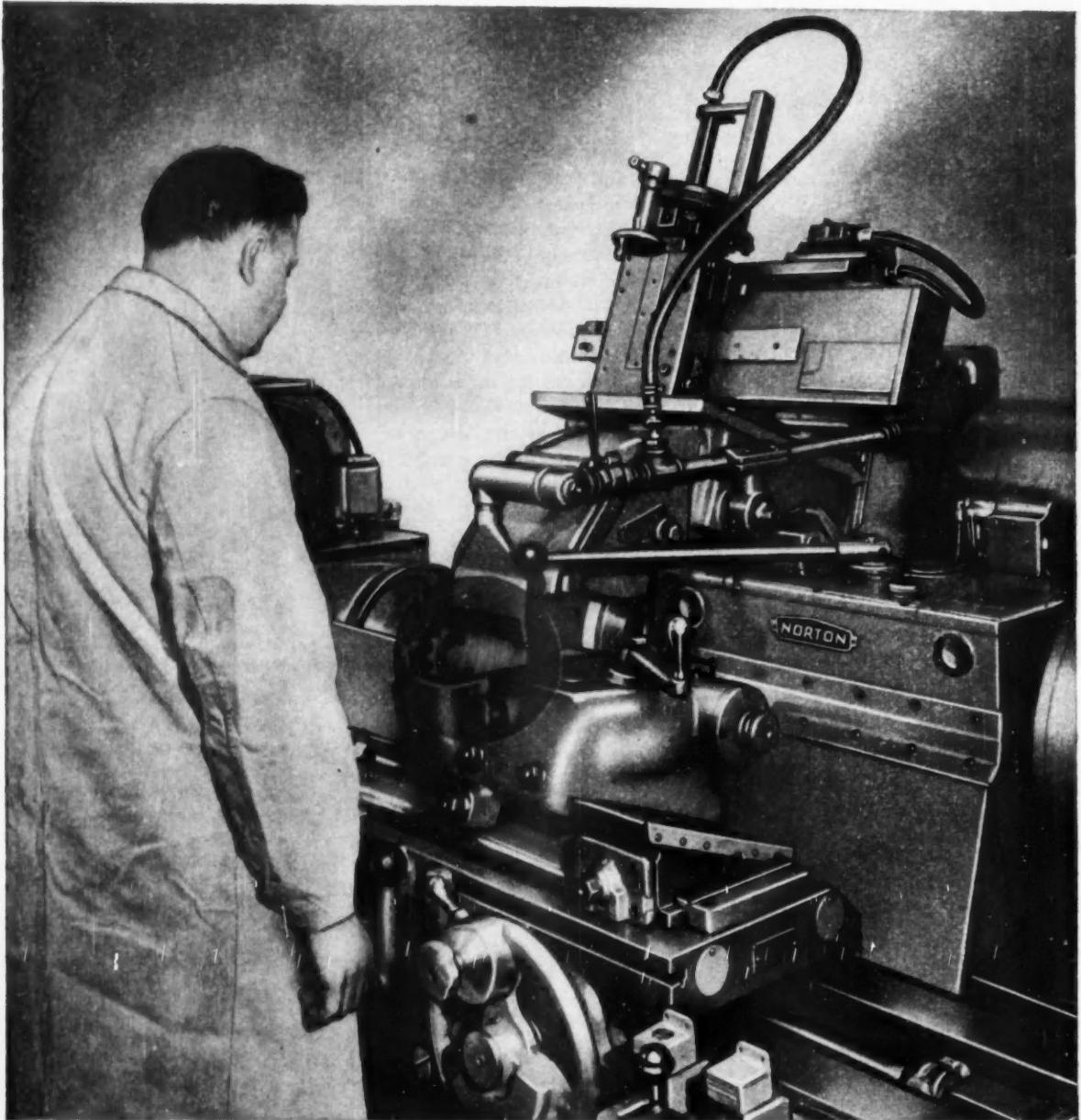
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## for heavy-duty cylindrical grinding

**Norton 10" Type CTU-HD brings new production speed  
to wide wheel plunge grinding jobs**

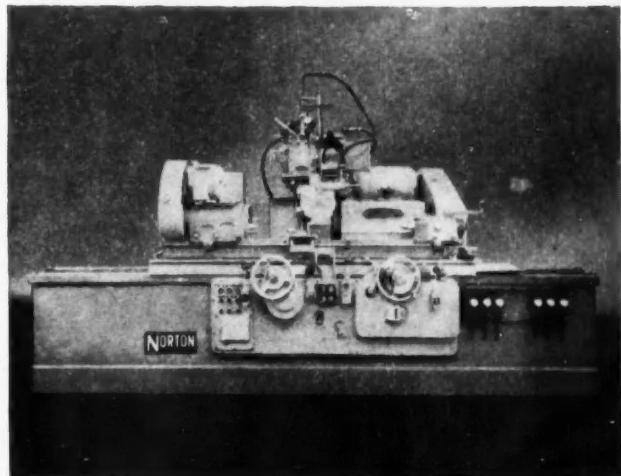
This is heavy duty cylindrical grinding at its modern best. This new 10" CTU-HD grinding machine adds value and usefulness to every piece of work it grinds. It gives you the "Touch of Gold" by increasing production rate and profit margin, too.

Norton 10" Type CTU-HD (and its companion 14" Type LCTU-HD for increased swing) employ very wide wheels or multiple wheels widely spaced for plunge cut operations. For such work as grinding crankshaft bearings, wheels of large diameter permit a maximum amount of wheel wear before interference with parts of the work.

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**LOOKING AT THE MOST MODERN** grinding machine of its type. A single operating lever puts the grinding cycle control within operator's easy reach at a convenient height. Special job-easing equipment such as the Automatic Wheel Guard Type Truing Device, the Endwise Work Locator, and the multi-diameter set of grinding gages as shown, is available as extra.

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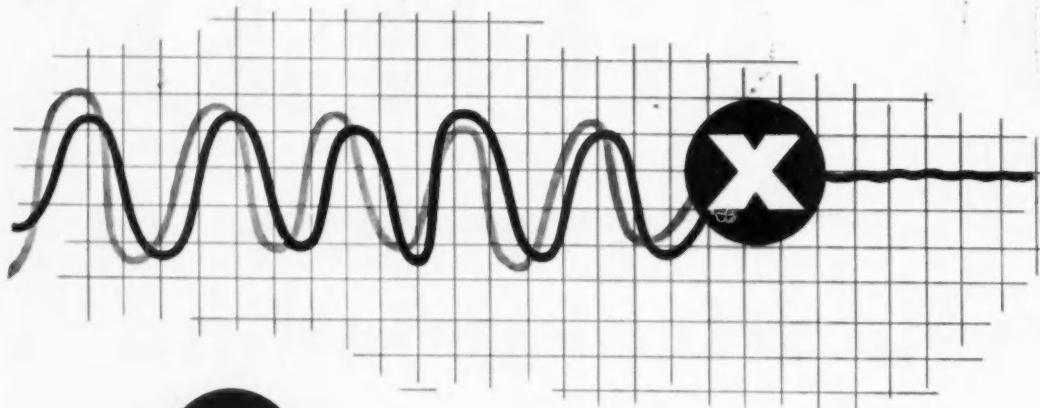
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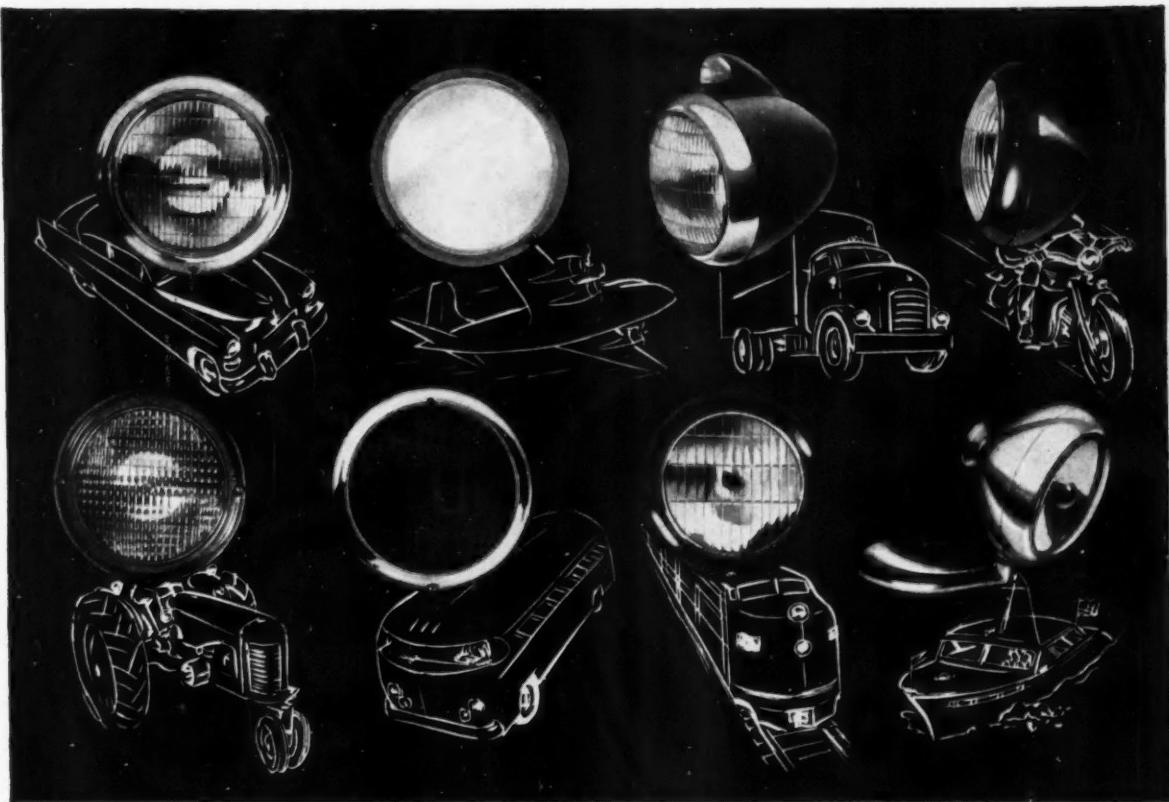
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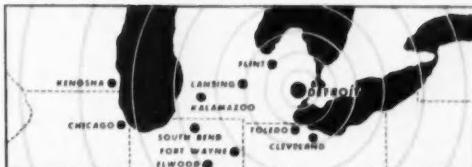


## Vision for Transportation

For each of the modern transportation miracles on land, on water and in the air, vision plays an important role. Engineers, designers and manufacturers are constantly studying the problems of vision . . . searching for ways it can be improved.

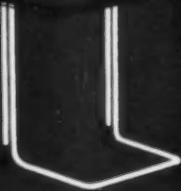
Since 1909, the C. M. HALL LAMP COMPANY has pioneered in America's lighting industry, and has contributed many major light-sight improvements. Today, with our subsidiary, INDIANA DIE CASTINGS, INC.,

we are supplying the many varied needs of civilian and military lighting. In our modern laboratories, we are at work developing better, more efficient lighting . . . striving to improve America's *Vision for Transportation*.



*Bright-spot in the Transportation Center!*

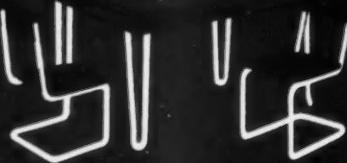




**OSTUCO  
TUBING**  
is versatile!



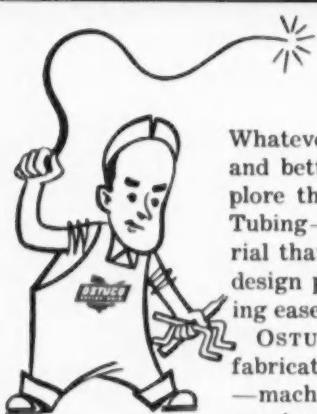
**OSTUCO  
TUBING**  
is versatile!



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TUBING**  
is versatile!



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is versatile!



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Tapering • Swaging • Flanging • Bending  
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Threading • Angle Cutting • And Many Others

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# News of the MACHINERY INDUSTRIES

By Thomas Mac New

Norton Co. Recovers from Damage to Plants by Storm. Delivery Dates of Orders Not Adversely Affected.

## Twister Strikes at Norton

Just two months ago, we described the unveiling of a new \$6 million plant built by Norton Co. to increase the firm's productive capacity. Only last month, however, the ravaging tornado that wreaked havoc upon Worcester, Mass., took a devastating toll of the plant. Steel decking was shorn from the roof, siding was stripped from the steel framework, and broken glass, debris, and water from broken pipes covered the entire factory and office area. Fortunately, all but eight employees escaped injury at the plant during the raging storm. The low casualty rate was attributed to the fact that employees had the presence of mind to take cover under machines, tables, and desks. Although the twister hit the area shortly after five PM, office personnel refrained from leaving due to the heavy rain which preceded the big blow.

From this point on, American resourcefulness took over. Three hours after the storm the Gilbane Construction Co., Providence, R. I., the firm that built the plant, had men on the job cleaning up the rubble. Since the initial clean-up program, approximately 100 men have been on the job, round-the-clock, Saturdays and Sundays included, to repair the damage wrought upon the stricken plant.

The Roger Sherman Co., Hartford, Conn., which moved the machinery into the new plant sent trucks and men from as far as Buffalo, N. Y., to aid in the emergency. Painting, packing, and erecting departments were moved to temporary quarters at the old machine plant on New Bond Street until permanent repairs are made to the shattered factory.

Most seriously hit side of the plant was Line One where heavy castings are machined. Machines in this area are said to have suffered superficial damage. Because of a very fine dust which covered the area, machines have to be torn down to check the bearing surfaces.

Machine tools which were partially assembled along the production line



More than a million dollars worth of damage was done to the Norton Company's new plant by the tornado which wreaked havoc upon Worcester, Mass. Only 62 hours after the damage occurred, as shown in the illustration, Norton continued with production.

also have to be torn down and rebuilt due to the dust and debris which littered the area. So rapidly did the company go to work righting the damage and getting back to work, that some machines were shipped to customers just three days after the disaster.

Hit by a swarm of telegrams concerning the status of orders, Norton replied that delivery dates were not adversely affected. Early last week the plant was right on schedule.

In addition to the new facility, approximately \$100,000 worth of damage was wreaked on the Abrasive Div. plant. Operations were not hampered and deliveries went on as usual.

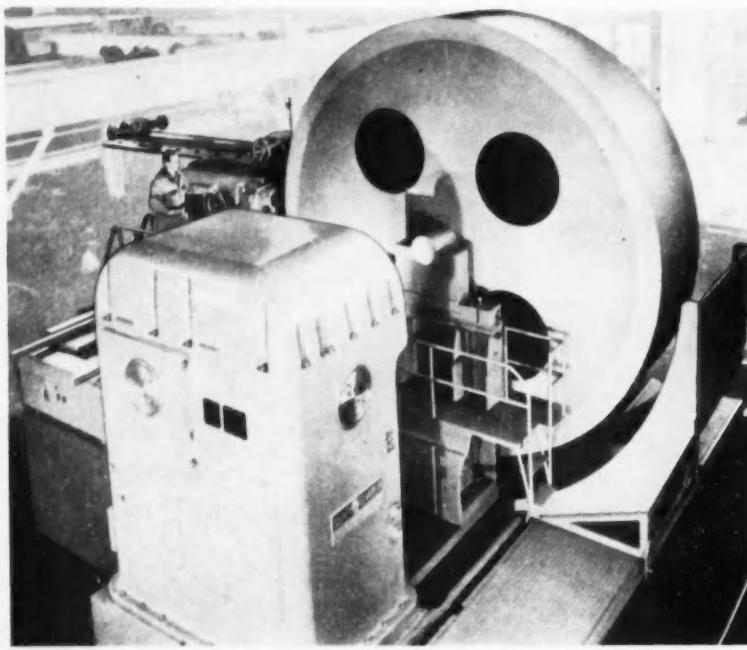
Not only did the company seek to solve its own problems, but it stepped in to help others in the disaster zone. It donated \$25,000 to the Central Massachusetts Disaster Relief Committee, kept its main hospital open throughout the period, opened its field house to the homeless, provided cash assistance to its employees in need, provided 15 to 20 trucks and 150 to 200 volunteers for cleanup operations,

supplied building materials to close in employees' houses, and set up storage space for their personal effects. The company is working closely with the Red Cross.

Norton also is providing space in one of its plants for another company that was seriously hit by the twister. The firm, Vellumoid Co., which makes gaskets and packing material, has set up manufacturing and packing operations in a building which formerly housed the Norton sheet metal department. Work is in progress to rebuild the Vellumoid plant as a completely modern, one story structure.

## New Association

Recently at Bedford, Pa., several companies engaged in the manufacture of fluid power components got their corporate heads together and emerged with a new association—The National Fluid Power Association. John C. Hanna, vice president, Hanna Engineering Works, Chicago, was elected Chairman of the Association. Other officers include: B. N. Ashton,



*What is said to be the world's largest shaving machine has been completed by National Broach & Machine Co., Detroit. It will handle gears up to 180 in. PD and, with certain modifications, work diameters can be increased to 200 in. This illustration shows the Red Ring, horizontal model, GCK-180, with a dummy gear in the shaving position. A gear 180 in. in diam will weigh approximately 30 tons and will have from 900 to 1800 teeth.*

president, Electrol Inc., Kingston, N. Y., 1st Vice Chairman; John E. Erskine, vice president, Racine Hydraulic & Machinery, Inc., Racine, Wis., 2nd Vice Chairman; and E. G. Peterson, president, Hannifin Corp., Chicago, Treasurer.

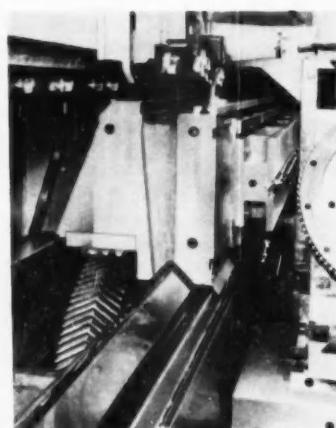
### Tools for Italy

Italy has been authorized by the Mutual Security Agency to buy \$3.5 million worth of machinery and equipment from the U. S. for use of the Fiat Co. in the production of turbojet parts. Included in the purchasing program will be \$2.5 million of American-made machine tools and \$450,000 worth of other metalworking equipment.

### General Machine Tool Orders Show Sharp Decline

New orders for machine tools in April took a sharp drop, the first decline since last November. The decline was all the more noteworthy, since the previous month the industry wrote the largest total of new business since last July. New orders totaled about \$82 million in April, compared with \$95 million in March. Cancellations so far this year have been running at about 12 per cent each month. Reason for the decline,

according to the machine tool industry, is the drop in orders from producers of defense items and also in Government buying. The industry is exhibiting some concern over the greatly increased production capacity, now at the highest point in history, which may not be fully utilized because of declining orders. The demonstrated production rate now stands at an index of 406.7 on the basis of 1945-47 equalling 100. The ratio of unfilled



*Massive main slide of the Lapointe electro-mechanical broach is driven by a continuous tooth herringbone bull gear and rack.*

orders to production rate in April stood at about 8.1 to 1, a drop from 8.5 to 1 in March.

### Lapointe Reports Many Orders for High Speed Broaching Machine

According to J. P. Crosby, vice-president, Lapointe Machine Tool Co., the company has booked orders for its high-speed (300 fpm) electro-mechanical drive horizontal broaching machine faster than expected. The firm is now in the process of preparing a brochure that should be made available to the trade shortly. This booklet will go into detail concerning the machine, the type of finish obtained, and the broaches utilized. We would like to suggest that you watch for this interesting booklet on the *Free Literature* pages of subsequent issues of AUTOMOTIVE INDUSTRIES.

### Around the Industry

Bullard Co. has changed its Cleveland district office address to 16828 Kinsman Road, Shaker Heights, Ohio.

Serfass Corp., New Haven, Conn., is said to be equipped to apply coatings of rhodium to non-conductive and conductive materials by using the vacuum technique. Its laboratory and production facilities are located in Bethlehem, Pa.

Lake Erie Engineering Corp., Buffalo, N. Y., has announced the establishment of a rolling mill and special products division for the supply of a broad line of auxiliary rolling mill equipment for ferrous and non-ferrous metals. The division is under the direction of J. P. Finkbone.

E. W. Bliss Co., Canton, Ohio, has elected the following new vice presidents: Richard Y. Moss, vice president and manager of the Canton, Ohio, Division; Robert Shannon, vice president and manager of the Hastings, Mich., Division; and Albert E. Whyman, vice president in charge of European operations.

Modern Collet and Machine Co., Ecorse, Mich., has recently announced that it will produce Tarex (Swiss) single spindle automatic turret lathes in this country. Two models will be built with a capacity range from 1½ in. bar stock to a six in. chucking capacity.

Cincinnati Metalcrafts, Inc., Cincinnati, Ohio, has announced the sale of the company's Sebastian Lathe Division to the Sheldon Machine Co., Chicago. All manufacturing operations will be moved to Chicago.

# NEW EQUIPMENT



FOR ADDITIONAL INFORMATION, please use postage-free reply card on PAGE 89

## Diagonal Shaving Machine Has Conventional Crown Added

Gear tooth crowning by the conventional method of rocking the machine table during the shaving cycle is a feature that has just been added to the Red Ring Model GCU shaving machine by a recent redesign.

Heretofore, crowning on this machine required a specially formed cutter, but now it can be done with any

standard rotary cutter while the work gear is being reciprocated in line with its axis.

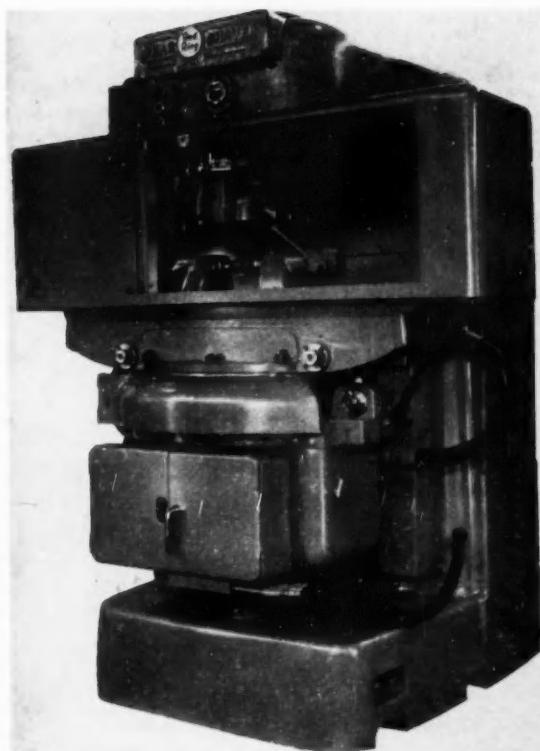
The rocking action of the table is accomplished by means of a central pivot and a cam which causes each end of the table to rise slightly as the end of the cutting stroke is approached.

The table has also been made considerably more rigid and the crowning cam located on table centerline to avoid any tendency to twist.

The point of maximum crown, although usually at the center of the tooth, may be shifted either way by changing the position of the work gear with reference to that of the cutter. The amount of crown is a function of the cam adjustment.

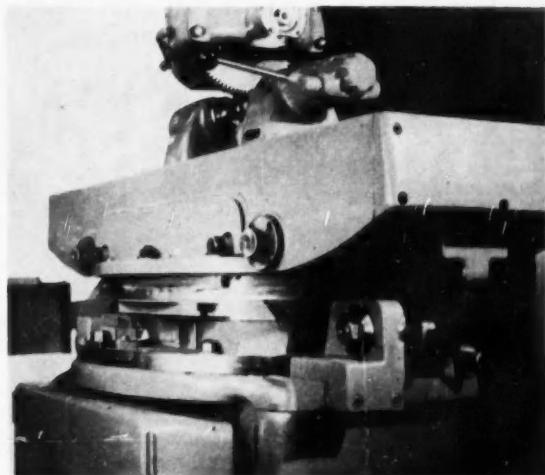
When it is desired to shave gear teeth, spur or helical without a crown, the crowning cam is disengaged. The table then remains horizontal throughout its stroke. *National Broach & Machine Co.*

Circle E-1 on page 89 for more data  
(Turn to next page, please)



*Red Ring Model GCU equipped for crowning and differential automatic feed up.*

*Below is shown the crowning cam (right foreground) on the gear shaver.*



**NEW****EQUIPMENT**

For additional information, please use postage-free reply card on page 89

(Continued from page 81)

**Mechanical Shapers Offer New Drive**

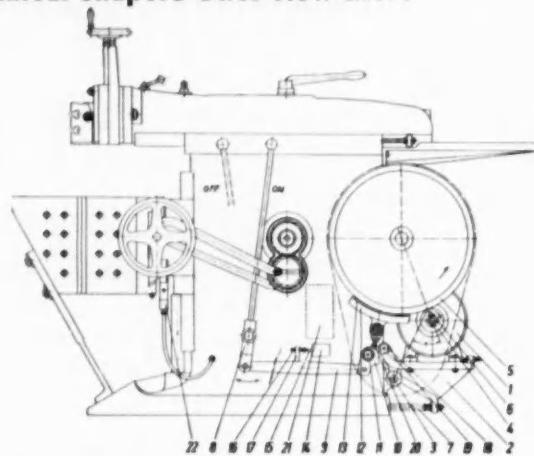
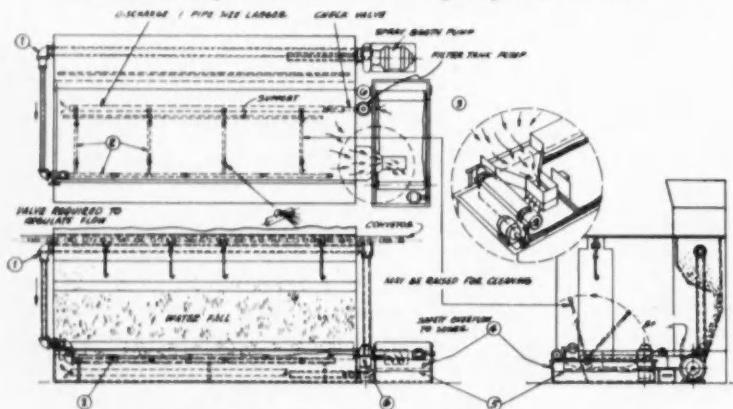
A "controlled contact" drive, in which pressure between friction wheel and drive wheel is always proportionate to the load on the machine, is a major feature of the latest line of Klopp mechanical shapers. Advantages claimed for the drive are: A single lever controls on and off positions of motor, engaging and disengaging of drive and setting and releasing of brake which stops tool head; and motor is always started under no-load conditions without the use of a mechanical clutch.

Controlled contact drive of the latest Klopp shapers, showing the machine from the operator's side with protective cover removed and the control lever in the on position. Drive motor (1) is mounted on seesaw table (2) which is carried on shaft (3). Synthetic rubber wheel (4) engages drive wheel (5) at point of contact (6). Contact is maintained by pressure springs (7). The control lever (8), by means of connecting rod (9), actuates the eccentric cam (10) which revolves around bolt (11). Brake shoe (12) with lining (13) makes no contact with drive wheel in on position. Motor switch is actuated by control lever through bar (15) by the withdrawal of set screw (16) on bracket (17).

When lever is moved to the off position, the eccentric cam engages roller (18), which is connected to the seesaw table through bracket (19), thus disengaging drive mechanism. Brake shoe is brought into contact with drive wheel by means of set screw (20) to stop the machine.

Electrical equipment includes switch relay (21) and two-way limit switch (22). (Kurt Orban Co., Inc.)

Circle E-2 on page 89 for more data

**Filtration System for Paint Spray Booth Water**

Recently developed is this filtration system for the removal of paint sludge and particles from paint spray booth water. This illustration shows the installation for a vertical type spray booth. The system can also be used for down draft booths. (Industrial Filtration Co.)

Circle E-3 on page 89 for more data

**Mobile X-Ray Unit**

An improved 250-kv mobile x-ray unit (Model 413) for radiographing unwieldy objects that require positive x-ray inspection is available.

Improvements in the model are principally in flexibility and ease of handling. The operator has been given additional protection so that he can stand inside the cab. The radius of turn has been improved so that the unit can be more easily positioned. The chassis has been strengthened and the center of gravity lowered.

Wide inspection coverage is accomplished with a long vertical column and a horizontal tubearm. The minimum tube-head-to-floor distance is 36 in. and the maximum 108 in. Throughout this 72-in. vertical travel, the tubehead has a horizontal travel of 48 in. The vertical column can be rotated 360 deg.

A 250-kv constant potential transformer provides power for radiographing up to 4½ in. of steel and proportionally thicker sections of lighter density materials. Westinghouse Electric Corp.

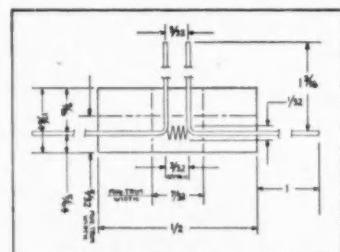
Circle E-4 on page 89 for more data

**1/32 In. Strain Gage**

The smallest SR-4 bonded resistance wire strain gage reported to have been developed has been added to a line of these gages. The SR-4 strain gage, Type AB-32, has a gage length of only 1/32 in., half of that of the former smallest gage. It is a Bakelite-base gage of the wrap-around type with cupro-nickel wire and is applied by phenol-resin cement. Nominal resistance is 120 ohms and the average gage factor is 1.4.

The gage factor is guaranteed within 10 per cent. However, a sample lot of nine gages included eight that were within three per cent of the average. Baldwin-Lima-Hamilton Corp.

Circle E-5 on page 89 for more data

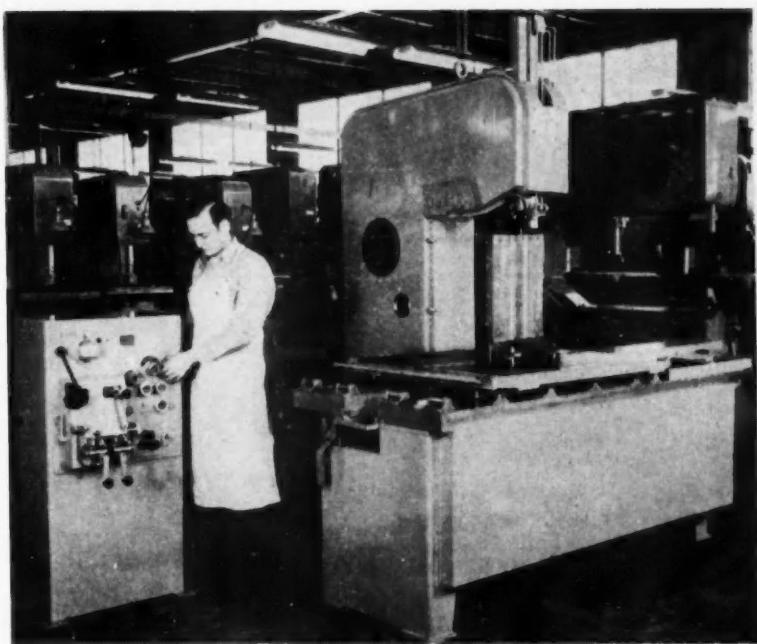


Baldwin SR-4 gage, Type AB-32.

## Remote Controlled Band Machine for Hazardous Operations

A special band machine operated by remote control has been made which accepts band tools for filing, grinding and polishing as well as sawing. This special machine has a work height capacity of 24 in., a 36 in. stroke, and is equipped with a hydraulically powered, heavy duty table. It incorporates the features of the standard MP-20—variable band speed control up to 10,000 fpm; automatic hydraulic brakes which stop the machine when the band tool breaks; facilities for air jet, mist or flood cooling; hydraulic positioning of the tool guide post; hydraulic tensioning of the saw band to limits controlled by the operator; two-way table tilt for cutting at an angle and other exclusive features.

Controls in this band machine, such as the blade welder and complete standard control panel normally incorporated into the column of the standard model MP-20, are housed separately in a remote control panel. The final installation of this separate control unit will permit every phase of the machine operation to be carried on at a safe distance from the machine itself. Saw band speed, speed of the hydraulic table, feed pressure,



*DoALL remote controlled band machine.*

height of the tool guide post, band tension, tilt of the table, etc., can all be controlled by the operator from his protected position. Hydraulic lines

and wiring between the band machine and the control unit are encased in heavy wall conduit. *DoALL Co.*

**Circle E-6 on page 89 for more data**

## Machine Drills and Mills Automotive Connecting Rods



*Cross drilling and milling machine.*

A special machine tool capable of drilling and milling 600 automotive connecting rods per hour at 100 per cent efficiency has been announced.

The machine has five stations: One for loading, one for milling the lock slot and three for drilling the stepped oil hole. Parts are held on a fluid, motor-driven index table. Work holding fixtures are hydraulically operated. Pre-set cutting tools are utilized.

Other features include hardened and ground ways, hydraulic feed and rapid traverse. Hydraulic and electrical construction is to Joint Industry Conference standards.

Maintenance is facilitated and still further reduction in downtime is claimed to be assured by the use of standard sub-assemblies. *Cross Co.*

**Circle E-7 on page 89 for more data**

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# NEW EQUIPMENT



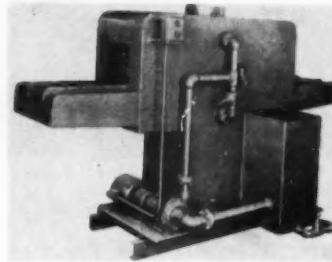
*For additional information, please use postage-free reply card on page 89*

(Continued from page 83)

## Washing Machine for Small Parts

Being offered is a standard small parts power washing machine designed for low production jobs or for cleaning between operations. A standard unit, tank and tables are so arranged that two units can be teamed together for a wash-and-rinse operation. It is equipped with a wheel roller conveyor, designed for standard work baskets, and incorporates all the features found in high-production conveyorized-power washing machines.

This same unit can be furnished with the special Niagara paddle wheel instead of a pump. This arrangement is reported to be ideal for screw machine work, where a great amount of chips are to be removed and the job calls for a large solution volume at a low head. This standard unit can be



*Blakeslee small parts washer.*

furnished for steam, gas or electric heat. In addition to all this flexibility the unit can be furnished in explosion-proof construction for use with petroleum solvents. *G. S. Blakeslee & Co.*

*Circle E-8 on page 89 for more data*

## Vacuum Frame Has Traveling Light

For broad industrial usage, a traveling light vacuum frame has been placed on the market. It is available in various sizes up to approximately eight ft wide by 20 ft 10 in. long.

It is a completely self-contained printing frame, except for the lamp transformers, for exposing all light sensitive materials, and has a variable-speed light source that provides uniform light distribution by means of a complete focal plane sweep.

With this frame it is possible to make exact reproductions of drawn parts on glass cloth, sheet metal and other mediums. The main light source is one or more quartz mercury vapor arc lamps. The drive member is an electronically controlled, variable speed, D-C motor with built-in worm reducer gear. Contact is established



*Bruning vacuum frame.*

between a vacuum blanket and a plate glass. Air is exhausted from the space under the blanket by a rotary positive displacement type pump which establishes a contact pressure of approximately 14 psi. *Charles Bruning Co., Inc.*

*Circle E-9 on page 89 for more data*



*Burg Model 2B.*

## Flange Mounting Machine

Flange mounting Model 2B can be mounted on any type of base, in a variety of positions, and it is designed so that two or more machines can be mounted on the same base at various angles in order that operations can be performed on different planes at the same time.

The drilling and tapping unit is equipped with a separate mounting electrical panel and chain counterweight unit. Model 2B can be secured with an automatic hydraulic feed at request. Specifications featured in this are: eight in. spindle travel, 12 pre-selective spindle speeds, 225 to 3000 rpm, four speeds per spindle, 12 in. throat depth. Maximum clearance from nose of No. 34B chuck to bottom of mounting flange is 8 $\frac{1}{4}$  in. The center of the spindle to the first mounting hole on the flange is 12 $\frac{1}{4}$  in. The size of the mounting flange is 15 in. by 12 in. Overall dimensions are—height 32 $\frac{1}{2}$  in., width-40 11/16 in., depth-15 in. *Burg Tool Mfg. Co.*

*Circle E-10 on page 89 for more data*

## Twist Drill Blanks

Redesigned standard cemented carbide twist drill blanks which are said to improve twist drill performance have been announced. The reduced thickness dimensions of the redesigned blanks are claimed to enable drill manufacturers to strengthen the point of each drill, providing more steel backing for the tip. There are five new sizes, TD-1 through TD-5, available. *Carbology Dept., General Electric Co.*

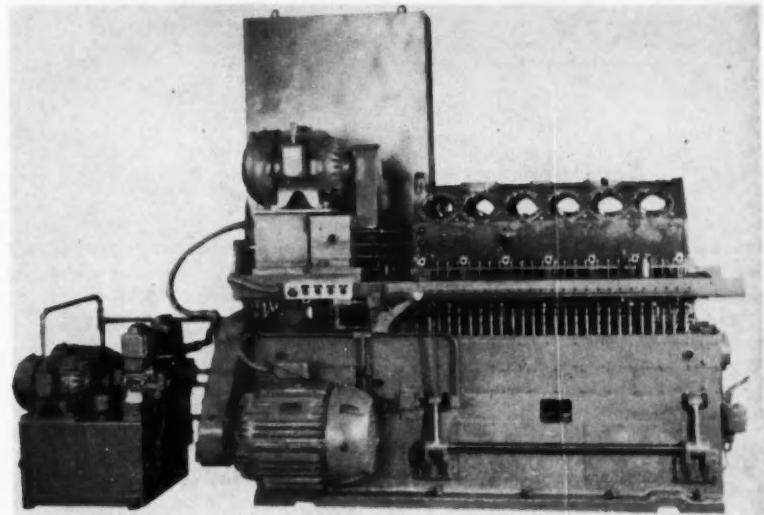
*Circle E-11 on page 89 for more data*

## Back-spotfacing Operations Performed by Multi-Spindle Machine

A 56-spindle machine back-spotfaces two parallel lines of 25 holes each in the pan rail face and six holes in the accessory end of an aluminum crankcase for internal combustion engines.

The crankcase is set onto hardened and ground rest plates on the table of the machine where it is correctly positioned by locating pins and is clamped in place. The table is lowered by hydraulic power so that the 50 cutter drivers extend upward through the previously drilled holes in the pan rail. At the same time, the six cutter drivers for the accessory end are moved into working position so they extend through the holes that are to be back-spotfaced. These six spindles are on a separate hydraulic feed unit that moves up and down with the main table. The cutters, each having a bayonet-type lock, are placed manually on the drivers.

With all cutters in position and positive stops moved into place, spindle rotation is started by electric push button and then the automatic hydraulic feed cycle is initiated in the same manner. The feed cycle includes adjustable timed dwell against the



Moline backspotfacing machine.

positive stops so that all spotfacing cuts will be of correct depth. Following the dwell, the reverse travel returns work and cutters to position where the cutters are removed from

spindles prior to withdrawal of the cutter drivers and unloading the crankcase from the fixture. *Moline Tool Co.*

Circle E-12 on page 89 for more data

## Indicator Measures Extension Under Load

An extension indicator for measuring extension under load in tension test specimens, and automatically controlling auxiliary devices, has been brought out. The instrument is applicable to any type testing machine in conjunction with any standard high magnification Microformer type extensometer of any gage length.

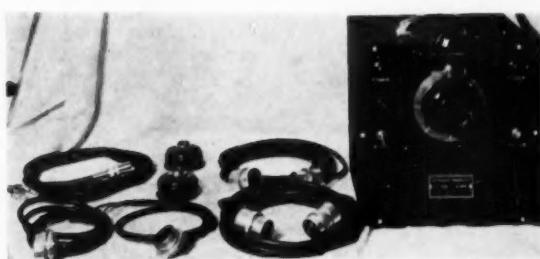
The extension indicator delivers signals at preset values of extension. Signals are visual (lamp), audible (buzzer), and electrical, closing relay contacts and actuating an auxiliary device such as a load holder, load indicator, load printer, or other device. Automatic printing of load values is under development. On certain test-

ing machines the load-indicating pointer can be held momentarily on signal to facilitate reading load at the desired extension.

Essentially, the instrument is a balancing Microformer actuated through an electronic amplifier under the control of the extensometer Microformer. Only control on the instrument is a dial graduated in tenths of a per cent extension up to 0.7 per cent by means of which the signals can be set for the desired extension. The dial is geared to the balancing Microformer armature in such a way that dial rotation is proportional to extension within the gage length of the extensometer. The indicator operates on standard 110-120-v a-c lines. *Baldwin-Lima-Hamilton Corp.*

Circle E-13 on page 89 for more data

(Turn to next page, please)



B-L-H extension indicator

**NEW**

# EQUIPMENT



For additional information, please use postage-free reply card on page 89

(Continued from page 85)

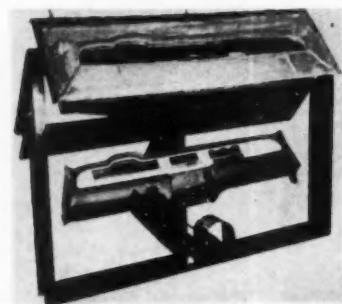
## Air Operated Spray Decorating Fixture

The spray-decorating of 175 instrument panels per hour, with one man loading, another unloading, and a third painting, is claimed to be accomplished on 1953 model cars by the use of a recently developed painting setup. This painting is done at

a transfer station on the conveyor line, thus combining the transfer handling and the painting operations.

Electro-formed metal masks, air-operated fixtures, and mask-washing machines are used for the job.

It is reported that 100 sprays are



Conforming instrument panel painting setup.

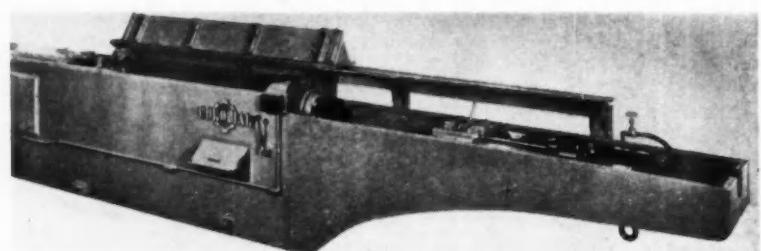
achieved before mask-cleaning is required. The fixtures operate at a pressure of 25 psi on the 28-in. stroke of a four-in. diam piston which produces a positive-pressure seal between the work and the mask. *Conforming Matrix Corp.*

Circle E-14 on page 89 for more data

## Broach Carrier Travels with Ram

Time and effort on operations requiring the use of multiple broaches in sequence are said to be reduced by a handy broach carrier rack, which is attached to and travels with the ram of a horizontal broaching machine. The rack can be designed to be adapted to any standard Colonial horizontal broaching machine where broaches are manually handled.

As the ram moves back and forth, the rack carrying the broaches moves with it. After each broaching pass, the broach is removed and placed in the rack. The ram is returned to a starting position, and the next broach is selected from the rack and inserted



Colonial traveling broach carrier.

in the puller of the broaching machine.

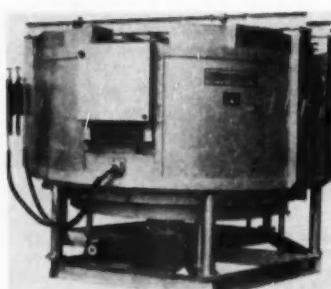
Broaches are also protected from damage to a greater extent since the rack with its padded broach supports

eliminates the operator's carrying broaches to and from stationary racks. *Colonial Broach Co.*

Circle E-15 on page 89 for more data

## Electric Rotary Hearth Furnace

Designed to operate continually at temperatures of 2500 F, a furnace now available has a rating of 260 kw with a capacity of 1500 lb per hr. Silicon carbide rod type heating elements which are arranged vertically can be replaced while the furnace is hot. A protective atmosphere is used to maintain a bright surface during hardening and to prevent the decarburization of special high temperature alloys. Within easy reach of the operator is a variable speed drive mechanism which can be adjusted for the desired speed of the rotating hearth



Hevi Duty rotary hearth furnace.

to match required production needs.

A process of continuous operation can be obtained as the operator loads the furnace by placing the cold parts on the seven ft diam hearth which is slowly rotating and removing the heated work as it passes the door opening. The door opening is 18 in. wide and adjustable between six in. and 10 in. in height. For the benefit of the furnace operator, a water cooled face over the chamber opening has been installed. *Hevi Duty Electric Co.*

Circle E-16 on page 89 for more data

## Semi-automatic Piston Grinding Machine

Now available is a complete packaged unit for piston grinding with a six by eight in. semi-automatic piston grinding machine.

Because of its action, this machine is said to provide the means for obtaining real economy in grinding elliptical automotive and aircraft type pistons to fine limits of size and finish. The machine can be specially arranged for grinding complex skirts where the degree of relief varies from the top to the bottom of the skirt.

The machine is a heavily built plunge grinder with a time-tested wheel spindle unit and a proved cam generating mechanism. This mechanism gives the special motion to the workpiece for grinding required skirt form.

Contributing particularly to the productivity of the machine is the fast, precise action obtained from the hydraulically actuated "revolving feed screw" wheel feed mechanism. This provides hydraulic features for rapidly traversing the wheel head, and mechanical micrometer screw feed during the grinding feed stage to assure finest accuracy in sizing.  
*Norton Co.*

Circle E-17 on page 89 for more data

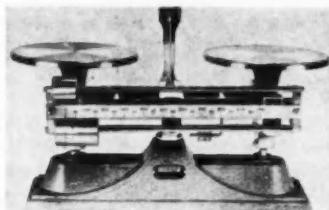
## Precision Balance

Recently announced is a balance featuring a micrometer poise. It is said to enable the balance to be used for a range from 0.5 to 1000 grams without additional weights.

The poise is designed so that it may be slid along the beam for rapid traverse and rotated for final positioning. The barrel is calibrated in .5 gram increments which subdivide the 10 gram beam divisions.

The balance has an undivided tare beam of one lb capacity. Self-aligning bearings are of agate and knife edges of precision hollow ground tool steel.  
*Ohaus Scale Corp.*

Circle E-18 on page 89 for more data



Ohaus precision balance.

## All-Magnesium Mobile Loading Ramp



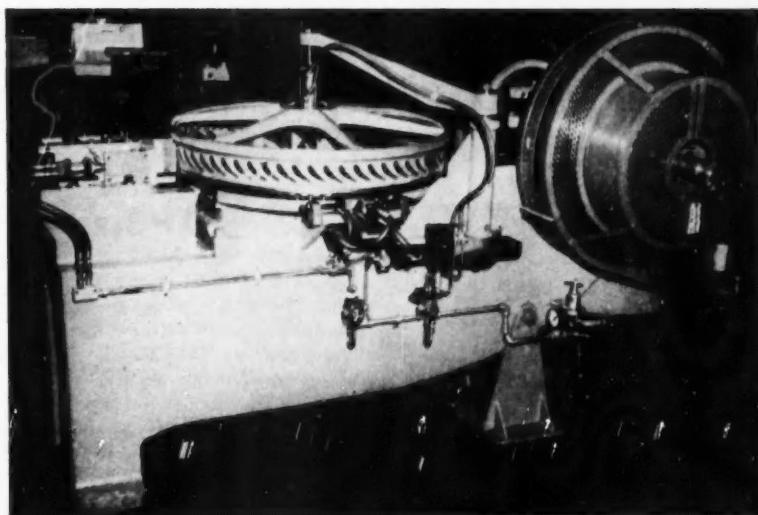
Production has been announced on an all-magnesium mobile loading ramp, which is designed primarily for use in facilitating the loading of yard cars. The ramp, it is stated, makes possible full utilization of power trucks in the loading operation.

Combining the strength of magnesium with its lightness, the ramp is engineered to support loads of 13,000 lb per axle, or more where required. Its lightness enables one man to move it about. It measures 30 ft long by approximately six ft wide.

Equipped with an hydraulic lifting mechanism, the ramp can be raised to any car level. A safety lock mechanism anchors the ramp securely to the car during loading. A retractile trailer hitch permits power towing for long distance mobility. In addition to the loading of yard cars, the unit is also used where dock facilities are overcrowded, as well as in places where no loading dock exists. (Magline, Inc.)

Circle E-19 on page 89 for more data

## Horizontal Press Pierces Jet Ring



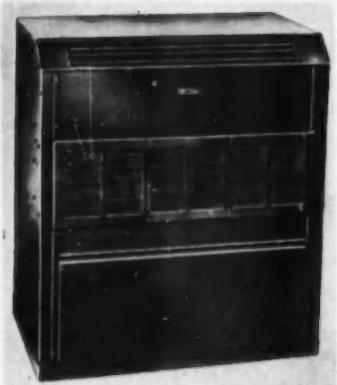
Specially constructed horizontal press has been developed for piercing slots in a jet engine vane ring for the airfoil blade. Equipped with an air clutch and special indexing feature, with complete electro-pneumatic control, the 64-slots are punched in 40 sec into a stainless steel ring measuring approximately 1/8-in. thick, 3 1/2-in. high and 32-in. diam. (V & O Press Co., Div. Emhart Mfg. Co.)

Circle E-20 on page 89 for more data

# NEW

# PRODUCTS.

FOR ADDITIONAL INFORMATION, please use postage-free reply card on PAGE 89



### Dehumidifier for Industrial Moisture Control

Now on the market is a heavy-duty electric dehumidifier for industrial use. Called Moisture Magnet, the self-contained unit is said to remove automatically excess water or moisture from the air of enclosed spaces in plants, storage rooms, laboratories, warehouses, or virtually any installation within its range where increased air drying or protection from moisture damage is needed.

Except for an electric outlet, no installation is necessary. No chemicals, duct-work, or air outlets are required. If desired, the unit may

be hooked up to a drainage system, or may be caster-mounted for mobility.

The dehumidifier comes in Model K10-D with a one-hp compressor and Model K12-D with a 1½ hp compressor. Units are available for 208 or 230 v, 50 or 60 c, single or three-phase current, and for 230 v dc. They are recommended for operation at room temperatures of 60 to 110 F and relative humidities of 40 to 100 per cent and may be used singly or in multiple units. *Air Conditioning Div., Remington Corp.*

Circle P-5 on page 89 for more data



### Bench-Type Vacuum Leak Detector

Now on the market is a portable, bench-type vacuum leak detector complete with self-contained vacuum pump. Known as the Junior, the unit is highly accurate and sensitive.

The detector is encased in a cabinet with an eight-in. diameter test pad attached. On the right side of the chrome-trimmed vacuum gage are a main vacuum valve for "draw down" and a vacuum breaker valve for releasing part. On the left is a conve-

niently located vacuum pump switch.

The unit is also available in three other models—an automatic leak detector unit, a surface flatness checker, and a flow comparator. The first automatically indicates good and reject parts with lights; the second checks flatness of surfaces in production; and the third measures flow through orifices or passageways in parts. *Whitington Pump & Engineering Corp.*

Circle P-6 on page 89 for more data



### Ribbon-type Sealer for Gasketing Uses

Recently announced is a fabric-reinforced black synthetic rubber sealer in ribbon form for use as a weather-proof, water-tight seal. Designated as EC-1202, the sealer is easily applied by simply laying or pressing the ribbon on one surface before riveting, screwing, or bolting the second surface to the first. It can be stripped off and reapplied.

Developed primarily to meet specific sealing needs in the house trailer industry, EC-1202 is adaptable for other gasketing applications, such as in buses. It can also be used as a water-tight, anti-squeak buffer in automobiles and trucks. *Adhesives & Coatings Div., Minnesota Mining & Manufacturing Co.*

Circle P-7 on page 89 for more data



### Hose for Handling Petroleum Products

Now available is a suction and discharge hose developed especially for handling all kinds of petroleum products under either pressure or suction.

The hose, known as Quaflex, is reinforced with two layers of braided

rayon cord, plus a helix of high-tensile spring steel wire. It is available in 1½-in. to three-in. ID sizes. *Quaker Rubber Corp.*

Circle P-8 on page 89 for more data

(Turn to page 138, please)

# Free INFORMATION SERVICE

**Postage-Free Postcards Are Provided Here for Your Convenience to Obtain FREE LITERATURE and Additional Information on NEW PRODUCTION AND PLANT EQUIPMENT, AND NEW PRODUCTS Described in This Issue of AUTOMOTIVE INDUSTRIES. Please Circle Code Numbers of Items in Which You Are Interested, Print Name, etc., and Mail Promptly for Quicker Service.**

USE THIS POSTCARD →

## FREE LITERATURE

### Materials Handling

Ready for distribution is a brochure on a line of materials handling equipment which includes a tractor and freight, fork, and several types of lift trucks. *Materials Handling Div., Market Forge Co.*

Circle L-1 on postcard for free copy

### Power Supplies

Bulletin GEC-970 describes a line of manually controlled and automatically regulated metallic rectifier power supplies for electroplating and similar processes. Advantages, applications, operation, ratings, dimensions, and specifications are included. *General Electric Co.*

Circle L-2 on postcard for free copy

### Steel Applications

Vol. 15, No. 2 of "Steel Horizons" contains a number of articles on products which employ stainless steel. Among the subjects are helicopters, fasteners, and automobiles. *Allegheny Ludlum Steel Corp.*

Circle L-3 on postcard for free copy

### Fabricating Facilities

Recently released is a circular on the organization of a company with facilities for cutting, forming and welding 16-gage sheet through 1/4-in. plate. *Whittington Fabricating Co.*

Circle L-4 on postcard for free copy

### Bearing Calculator

Now available is a calculating device which supplies bearing users with information necessary in the selection of ball thrust bearings. *Actna Ball and Roller Bearing Co.*

Circle L-5 on postcard for free copy

### Decalcomanias

Now available is a leaflet which covers a line of decal window valances and signs which manufacturers may offer to their dealers as advertising aids. *American Decalcomania Co., Inc.*

Circle L-6 on postcard for free copy

### Industrial Truck

Currently available is a brochure on the Xpediter industrial truck in several models for fast materials handling. *Kalamazoo Manufacturing Co.*

Circle L-7 on postcard for free copy

### Metallizing

Bulletin 51A explains the use of metallizing in production processing. *Metallizing Engineering Co., Inc.*

Circle L-8 on postcard for free copy

### Lift Trucks

Bulletin TI covers various types of Red Giant and Go-Getter lift trucks. *Revolvator Co.*

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(Please turn page)

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L-3 L-9	L-15 L-21	E-3 E-9	E-21 P-3 P-9 P-15 P-21 P-27
L-4 L-10	L-16 L-22	E-4 E-10	E-22 P-4 P-10 P-16 P-22 P-28
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**FREE LITERATURE—Continued**

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**Driving Aid**

Now available is a circular on a device known as Steadi-Drive which consists of an accelerator control and switch for the left foot. When desired acceleration is reached, speed may be maintained merely by depressing foot switch without right foot on accelerator. *Dixon Automatic Tool, Inc.*

Circle L-10 on postcard for free copy

**Surface Grinders**

Recently released is a 20-page catalog on a line of precision surface grinders for tool room and production grinding operations. *The DoALL Co.*

Circle L-11 on postcard for free copy

**Fan Drive**

Ready for distribution is a circular on a thermostatically controlled fan drive for heavy-duty engines to maintain coolant temperature at most efficient level. *Schwitzer-Cummins Co.*

Circle L-12 on postcard for free copy

**Steel Powders**

Bulletin No. 3 describes the physical properties of various pre-alloyed steel powders and the mechanical properties that can be obtained by various procedures. *Vanadium-Alloys Steel Co.*

Circle L-13 on postcard for free copy

**Power Presses**

Bulletin No. 223 contains complete specifications for a line of horn-type power presses as well as cutaway drawings showing engineering details. *Clearing Machine Corp.*

Circle L-14 on postcard for free copy


**USE THIS POSTCARD**
**Weight Indicator**

Bulletin W-1 describes an accurate and portable weight indicator for on-the-spot checking of materials. *W. C. Dillon & Co., Inc.*

Circle L-15 on postcard for free copy

**Hydraulic Motors**

Bulletin M-5103 describes two new sizes of vane motors, Series M2-300

and M2-400. The first is available in 7.7, 10.2 and 12.8 hp output sizes, and the second in 16.6 and 21.6 hp sizes. *Vickers, Inc.*

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**Projection Spot Welders**

Bulletin Nos. 305-1 and 306-1 cover EPT 2 Series air-operated, press-type, three-phase, electric-resistance projection welder and SPT 2 Series spot welder, respectively. *Sciaky Bros., Inc.*

Circle L-17 on postcard for free copy

**Lubricating Oils**

Technical Bulletin No. 17 covers new Solnus oils with good time-temperature characteristics that can be applied by any method. *Sun Oil Co.*

Circle L-18 on postcard for free copy

**Materials Testing**

Vol. 8, No. 2 of "Testing Topics" features four articles on materials testing and instrumentation. *Baldwin-Lima-Hamilton Corp.*

Circle L-19 on postcard for free copy

**Intake Filters**

Bulletin SIF describes Staynew intake filters for internal combustion engines, compressors, blowers, motors, and generators. *Dollinger Corp.*

Circle L-20 on postcard for free copy

**Phenolic Casting Resin**

Now available is a 16-page booklet on liquid phenolic casting resin for numerous industrial applications. *Durez Plastics & Chemicals, Inc.*

Circle L-21 on postcard for free copy

**Research Facilities**

Currently available is a booklet describing facilities for industrial research and development. *Commonwealth Engineering Co. of Ohio.*

Circle L-22 on postcard for free copy

**Energy and Fuels**

Fresh off the press is a booklet on a program of research in energy and fuels. *Battelle Memorial Institute.*

Circle L-23 on postcard for free copy

**Reamers**

Catalog No. 53, now available, contains specifications on a broad range of reamers. *Lavallee & Ide, Inc.*

Circle L-24 on postcard for free copy

(See preceding page)

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L-5 L-11 L-17 L-23  
L-6 L-12 L-18 L-24

**NEW PRODUCTION &**

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E-2 E-8 E-14 E-20

**PLANT EQUIPMENT**

E-3 E-9 E-15 E-21  
E-4 E-10 E-16 E-22

**NEW PRODUCTS**

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Los Angeles 15, Calif.

# NEW



## AIRCRAFT PRODUCTS

FOR ADDITIONAL INFORMATION, please use postage-free reply card on PAGE 89

### Rubber-to-Metal Bonding

Recently developed is a rubber-to-metal bonding process known as Permadizing. The new technique offers to designers a rubber-to-metal material whose dimensional tolerances can be held as closely as metal.

Bonded parts are said to be available for operation in a wide range of temperatures, exhibit extremely low swell, are highly resistant to aromatic fuels and hydraulic fluids and have a steel-smooth precision finish. Permadized parts can be made corrosion-resistant. *Stillman Rubber Co.*

Circle P-1 on page 89 for more data



Stillman bonded parts.

### Fuel Flowmeter Features High Accuracy

Accuracy, simplicity, and operational ruggedness are among the advantages claimed for a compact airborne fuel flowmeter recently developed. The system consists of three components; a flow sensing element; a rate indicator reading in either lb per hr or gpm, and a totalizer unit.

The flow rate indicator electronically converts the a-c signal from the sensing element to a proportional d-c output which is measured and indicated as rate of flow. It is available in either Model 19 with front calibration adjustments and a needle-type pointer, or in Model 19AN with a solid dial face and a broad pointer. Both models use 270-deg movements. The

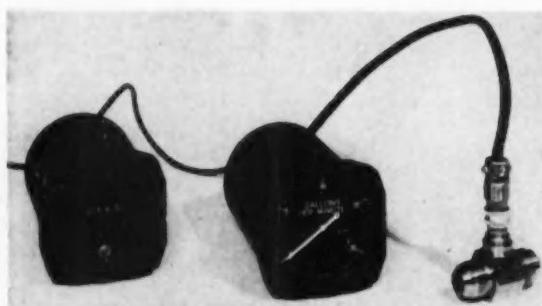
rate indicator can be used with the totalizer or as an independent unit.

Model 20 totalizer, built to the same dimensions as Model 19 rate indicator, registers the total number of output pulses produced by the flow sensing element, divided by a factor of 32. The indicated reading is multiplied by a constant factor to obtain volume of flow.

Each complete unit is secured to the instrument panel by means of four mounting bolts.

Systems are available for operation from either 400-c, 115-v a-c or 24-v d-c power supplies. *Potter Aeronautical Co.*

Circle P-2 on page 89 for more data



Potter fuel flowmeter.

### Engine Mounting

Recently announced is an engine mounting for R-2800-C engines. This Dynafocal MR-36M unit is interchangeable as to vibration characteristics and physical dimensions with engine mountings now in use on several types of commercial and military aircraft using R-2800-C engines.

It is claimed that the mounting is extremely strong, although light in weight. In some applications, the saving is reportedly upwards of 16 lb per engine. *Lord Manufacturing Co.*

Circle P-3 on page 89 for more data



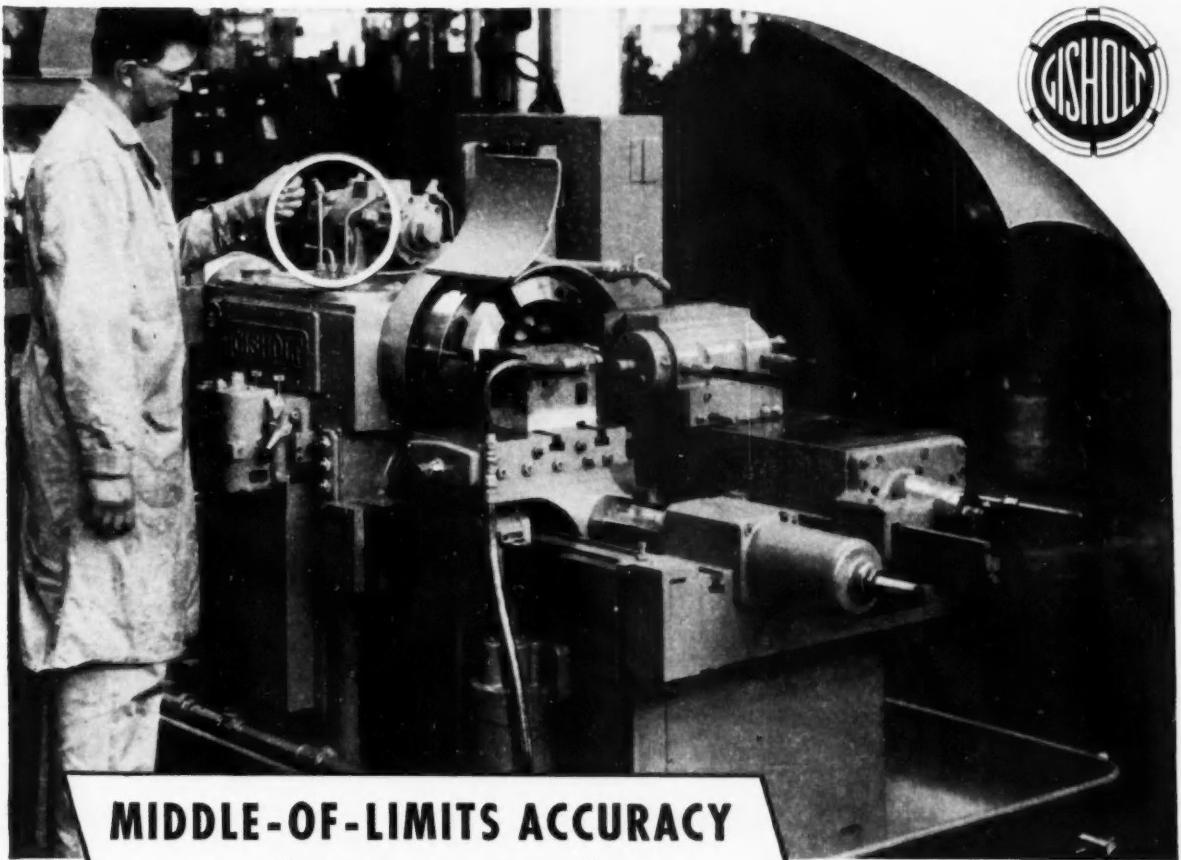
Lord MR-36M Dynafocal engine mounting.

### Servo Motor

Now on the market is a miniature precision servo motor approximately one in. in diameter and slightly over one in. in length. It is available for frequencies varying from 60 to 400 c, and in two, four, or eight-pole types.

Stall torque ranges from .25 to .35 oz-in. *G-M Laboratories, Inc.*

Circle P-4 on page 89 for more data



## MIDDLE-OF-LIMITS ACCURACY

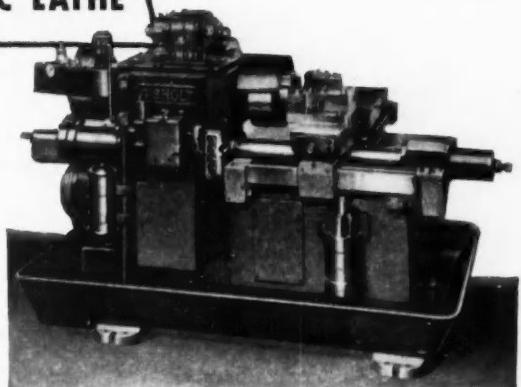
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### NO. 12 HYDRAULIC AUTOMATIC LATHE

Loss of accuracy due to wearing parts? You won't get it with this modern automatic lathe—even after years of hard service. There are no complicated mechanisms to wear—it's that simple!

All parts having to do with tool movement are completely surrounded by oil and lubricated under pressure. Both carriages move on hardened and ground steel surfaces. For all practical purposes, there is no wear-out. Since both front and rear tool slides feed against and dwell at positive dead stops, utmost accuracy is assured in finished dimensions.

Yes, you can count upon middle-of-limits accuracy for many years to come. What's more: you can count upon trouble-free operation that cuts maintenance bills to almost nothing. Write for literature.



THE GISHOLT NO. 12 HYDRAULIC AUTOMATIC LATHE is a heavy, rugged machine, yet well suited for light, fast jobs.

# GISHOLT

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THE GISHOLT ROUND TABLE  
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# METALS

*Some Letup in Demand for Steel. Lead Market Strong as Price Advances. Copper Fabricators' Inventories High.*

By William F. Boericke

## Excess Steel Capacity Feared

Peaceful settlement of the wage controversy with the steel workers was anticipated. Quite in line was expectation of a probable increase in the base prices of about \$4 per ton to compensate for higher labor costs. Whether such higher prices can be maintained in the highly competitive days ahead remains to be seen.

Some experts in the steel trade have been wrong for months on their forecasts as to time and extent of the decline in steel demand, and today is no exception. Producers in general are worried over excess capacity. Leading sales executives of steel companies told the National Association of Purchasing Agents that demand and supply in steel are coming rapidly into balance and a turn-about can come very fast. On the other hand, many consumers, particularly the big automobile manufacturers, don't agree.

Nevertheless, some signs stand out that steel demand is easing slightly. Warehouse inventories have now reached their highest point since September, 1949. Galvanized products are in comfortable supply. A decline in new orders has been noted in the machine tool industry. Conversion deals are out of favor. Some cancellations have been received because of production cutbacks at consumers' factories. Export business is unsatisfactory and especial resentment has been noted against inclusion of "extra" charges. British and Continental steel manufacturers are going all-out for foreign business.

## Outlook Good for Third Quarter

An end of hostilities in Korea is not expected to start an overnight decline in the steel market. Only 12 per cent of steel capacity has been employed in filling defense requirements and in any event this modest amount won't be eliminated, at least in 1953. Steel order books are generally well filled on major products through the third quarter with larger carryovers of undelivered second quarter orders. There's some uncertainty over the fourth quarter, and even the optimists expect a moderate decline from the present capacity rate of 117.5 million ingot tons annually. If second half consumption is no better than in the first half of the year, total steel used will be about 115 million tons. Perhaps 110 million tons would be a better guess. That would be 91 per cent capacity and satisfy producers.

## Copper Sells Lower on Future Market

Buyers are hesitant over making heavy commitments in copper for the second half of the year at the current price. This is plainly indicated on the New York Commodity Exchange when trading was resumed last month after a two-year lapse. In contrast with the spot price of 29½-30 cents per lb for the metal, September futures are quoted at 26¾ cents and December at 25¼ cents. For the early months of 1954 copper is offered below 25 cents.

The copper trade is deeply concerned over the price to be established in London next August 5 when copper trading will start on the London Metal Exchange. The drastic price declines that followed open trading in lead and zinc in London are fresh in mind. It is known that copper stocks in Great Britain are large, estimated around 200,000 tons as against 131,000 tons at the beginning of 1953. Should the British Government sell copper freely, a price decline would appear inevitable with repercussion on our own market. Knowledge that this large stockpile of metal which, unlike our own, can be sold by the British Government at its own discretion without legislative action, introduces considerable uneasiness among consumers.

## Korean Truce to Cause Stretch-Out in Defense Buying

The likelihood of a military truce in the Korean fighting will probably cause a stretch-out in defense buying that will affect the copper market. About 25 per cent of the present brass output and about 15 per cent of the wire mills' products have gone to the defense program. However, operations still continue at a high rate with shipments heavy and the mills expect business to continue good through the third quarter, although undoubtedly the vacation period in July will cause a pronounced decline in deliveries. Brass mills derive considerable satisfaction from larger orders for shell cases from the Army. It appears that substitution of steel for brass has not been satisfactory.

## Copper Deliveries Continue Large

The May statistics of the Copper Institute show a slightly larger output of primary copper by the smelters, a heavy decline in receipts of scrap copper, and tremendous deliveries of refined copper to the fabricators, which came to 146,815 tons for the month. They also show a small increase in smelter stocks to

(Turn to page 106, please)

# Studebaker



another leading manufacturer, selects Perfect Circle piston ring

sets—including chrome compression rings—

for authorized replacement service.



**Automotive engineers know** that the most important piston rings in an engine are the *top* compression rings . . .

For they must operate where heat is the highest, where pressures are the greatest, where lubrication is the poorest...

That's why engineers specify Perfect Circle Chrome Rings for authorized replacement service. For the solid chrome plating resists wear, resists heat, and prevents scuffing and scoring of cylinders and pistons. Perfect Circle Corporation, Hagerstown, Indiana; The Perfect Circle Co., Ltd., Toronto, Ontario.



# Perfect Circle

**PISTON RINGS** The standard of comparison



Fig. 1—The heavy steel forging produced by the closed die technique, for initial production of the strut trunnion.

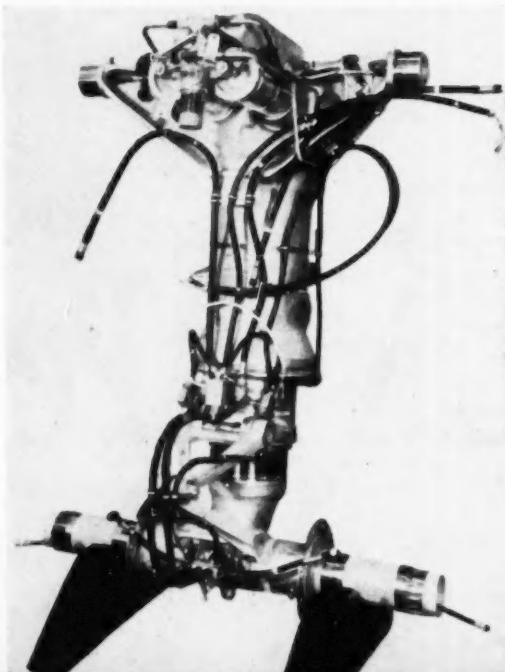


Fig. 2—The one-piece aluminum forging, currently made of 14-ST aluminum alloy, resulted from the development program at Bendix. Total weight in the rough is only 771 lb.



Fig. 3—This is the same aluminum alloy trunnion as shown in Fig. 2 after finish-machining.

Fig. 4—Overall view of B-47 strut assembly incorporating the present aluminum alloy trunnion.



## A Better Landing Gear Strut for the Boeing B-47 Bomber

Aluminum Alloy Forging for Trunnion  
Reduces Weight, and Saves Time and Material

**I**N these days of astronomical military expenditures for the defense program, it is heartening to find examples of cooperation among manufacturers and the military establishment, resulting in major dollar savings to the Government as well as the taxpayers.

One recent example is found in the production development of the steerable landing gear shock strut for the new Boeing B-47 bomber by the Bendix Products Div., Bendix Aviation Corp., South Bend, Ind. Although Bendix has been credited with outstanding quality and performance in landing gears manufactured by the organization, the case of the B-47 strut assembly reveals more clearly the importance of practical experience and know-how in launching a new component.

Bendix was commissioned to build a prototype from a design by Boeing Airplane Co., the prime contractor. The first model, naturally, was produced by toolroom methods. A major part of the job was the forging, fabrication, and machining of the trunnion which consisted of two alloy steel forgings—the main trunnion forging and a tubular section welded to the trunnion. Initial production was established after considerable development work, using the steel forging shown in Fig. 1. However, it was recognized immediately that the two-piece assembly was extremely expensive not only from the standpoint of cost but because of the enormous amount of metal removal required in Keller machines. The time consumed on such critical equipment was rec-

(Turn to page 102, please)

# Thompson

*makes a complete line of piston pins and cylinder sleeves for the automobile type engine*

Thompson's engineering and production skills have been developed by the production of jet aircraft engine parts and other parts of almost unbelievable complexity, made to the closest tolerances in the aircraft industry.

These techniques and skills have been applied to mass produced products such as piston pins and cylinder sleeves. The same metallurgical knowledge and manufacturing know-how that are used in making piston pins for powerful aircraft engines and long-lasting cylinder sleeves for powerful truck and tank engines, are used in making them for the mass produced automobiles and trucks of today.

If you are having trouble with engine parts—if you need a better, more dependable supplier for a *complete* line of both piston pins and cylinder sleeves, just write or call *Special Products Division*, Thompson Products, Inc., 2196 Clarkwood, Cleveland 3, Ohio.

**You can count on**

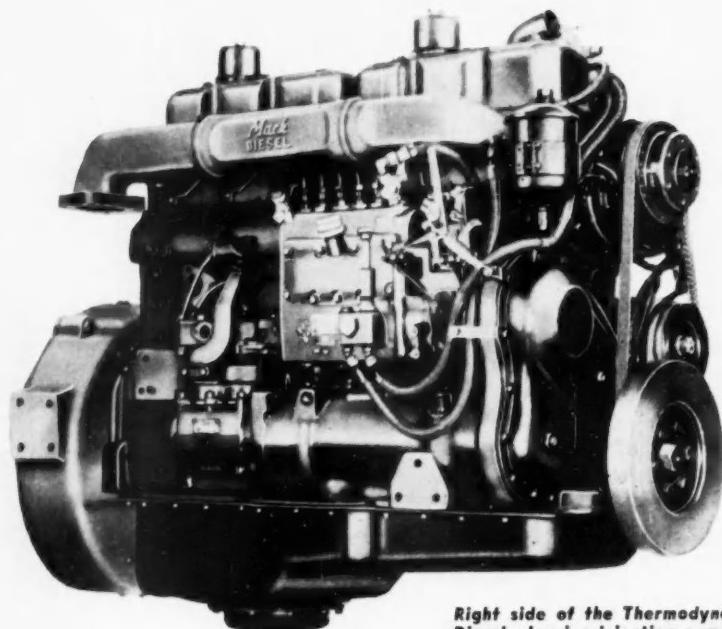
## Thompson Products

SPECIAL PRODUCTS DIVISION

# MACK

## *Brings Out*

# New Diesel Engine



Right side of the Thermodyne Diesel, showing injection pump and governor, air compressor, three-piece exhaust manifold and breather caps mounted on aluminum valve covers.

**M**ACK Trucks, Inc., announces the introduction of a new Diesel engine, the Mack Thermodyne Model END-673. This new engine develops 170 bhp at 2100 rpm, and torque output is 480 lb ft, maximum, at 1200 rpm.

A feature of the engine is its combustion chamber design, which is said to be primarily responsible for its fuel economy. Formed entirely in the piston crown, the combustion chamber is semi-toroidal in shape, with an essentially flat cylinder head surface. The design of the intake port imparts a tangential direction of flow to the incoming air which results in a swirling movement in the combustion chamber. As the piston head

rises, the semi-toroidal shape of the piston crown accelerates the swirling air into a vortex traveling at such tremendous speeds that it tears the fuel spray to minute particles as the fuel issues from the injection nozzle.

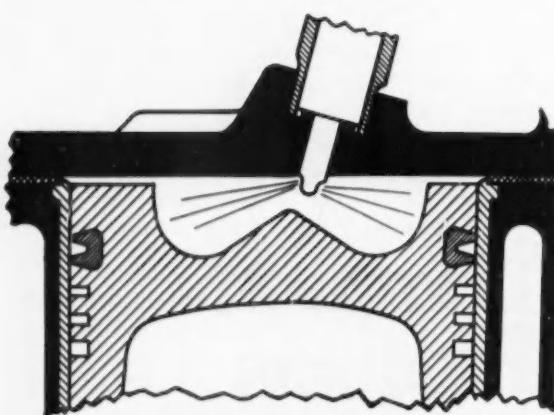
Mack states that in addition to affording rapid and complete combustion, the Thermodyne combustion chamber assures more efficient injection nozzle cooling. The newly-designed pistons eliminate hot spots by reducing heat concentration in the piston head, while the compactness of the combustion chamber, with its reduced heat-rejection surfaces, increases engine efficiency.

A choice of either electrical or air starting equipment is available with the electric system standard and the air system optional.

Popular features of previous Mack Diesel engines are incorporated in the new Thermodyne Diesel. It has the Bosch multiple-unit injection pump, with drive directly from the timing gears, and rigid flange-mounting. High-pressure piping connects each plunger-type pump to its four-hole spray-type injection nozzle.

Injection is rack-controlled by a variable-speed hydraulic centrifugal governor, to produce an engine speed corresponding to the position of the accelerator pedal. This is similar to the throttle control of a gasoline engine, except that the governor automatically compensates for variations in load placed on the engine.

In addition to the torque control and speed-droop characteristics, the governor completely shuts off fuel when the engine is drifting. While this results in some fuel saving, it is more important as a control and safety factor, since it permits full utilization of the



Thermodyne Diesel combustion chamber. Note inclined position of the injection nozzle and the direction of fuel spray.

(Turn to page 118, please)

# STERLING'S NEW CONFORMATIC\*

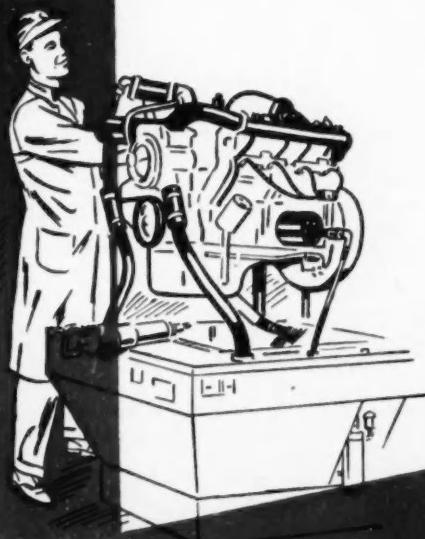
## PISTON

THIS STEEL  
TENSION MEMBER  
Maintains fitting  
clearance from  
-20° F. to 200° F.

Can Be Safely Fitted  
to **LESS** Clearance  
...Without Danger of  
Scuffing or Seizing

You get quieter engines, eliminate cold slap and reduce friction . . . without sacrificing piston strength or conductivity. No cold slap at temperatures as low as -20° F.... no seizing or scuffing at 200° F.

LOOK AT THESE TEST RESULTS . . .



### RESULTS OF 1200 Hour CYCLE TEST

In recent cycle tests made by one of the largest automotive manufacturers, Sterling Conformatic pistons were fitted into a stock engine at .0005 clearance. After operating the engine for 1200 hours, approximately half of that time at full load and full throttle, the Conformatic Pistons were pronounced perfect.

**STERLING**  
PISTONS

U.S. Pat. Off., Patent Applied for

STERLING ALUMINUM PRODUCTS, INC. • ST. LOUIS, MISSOURI

# Tooling Powerglide Transmissions

(Continued from page 50)

called for entirely new and considerably longer transfer equipment.

As it happens, the supplier was about ready to introduce a new line of Kreuger self-contained drill units which had not yet been installed on a production line. These are truly compact midget-sized units, capable of close coupling and requiring relatively small space for installation. Re-

quiring only one-hp motor drives, these units have a long stroke, up to 12-in., and are capable of drilling large diameter holes in steel. By using a suitable number of these Kreuger heads it was possible to extend each of the two machines within the limited space available and thus create entirely new transfer machines at nominal cost. By far the

greatest advantage of this move was the fact that the installation was done right in the plant without the loss of time usually involved in building a new machine.

The illustration shows the end section of one of the machines, highlighting the battery of Kreuger units. It shows the compactness and flexibility of this arrangement. Moreover, this machine is adaptable to further product engineering changes simply by rearrangement of heads, changes in angularity, or changes in mounting bases.

Automatic transmissions with their labyrinths of oil galleries and passages pose an unusual problem from the standpoint of cleanliness—freedom from dirt, chips and burrs—since any of these can ruin operation of the unit. Chevrolet pioneered in this field with the adoption of impressive salt bath equipment for treating castings as received from the foundry. However, this does not dispose of the problem of further cleaning after machining operations have been completed. At the insistence of the plant manager some further operations were added recently.

In the case of bell housings and transmission cases — both honeycombed with oil passages and crosses—all holes are run through with special wire brushes as a hand operation at the end of the line. That serves to remove burrs and free the lines of chips. Then each casting is transferred to a special fixture where the oil lines are thoroughly flushed and cleared with a series of jets fed with oil at a pressure of 200 psi. Following this, the parts are put through a washing machine fitted with an indexing conveyor. At one station the conveyor dwells to permit oil passages to be blown out with pressure jets of chemical cleaner to remove oil. At a later station the work dwells again to permit the oil passages to be blown through with high pressure air jets. The entire part, of course, is chemically cleaned in the process.

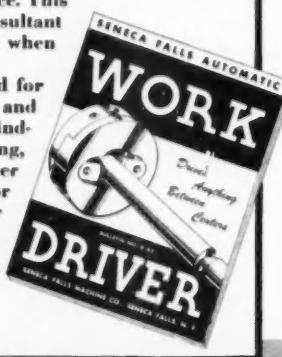
**SENECA FALLS**  
Automatic  
**WORK DRIVER**  
*Drives Anything  
Between Centers*

**Jaws with angular serrations ... NOW STANDARD**

These self-centering, quick-acting Drivers have long demonstrated their ability to eliminate dogging time and to enable one operator to attend multiple machines. Their application has been widened with development of a new jaw having serrations milled at a suitable angle. These angular serrations provide an overlapping contact for surer and quicker grip on smooth finished, as well as hot rolled stock and forgings having a relatively hard surface. This positive grip eliminates slippage and resultant tool breakage . . . especially important when costly carbide tools are used.

Seneca Falls Work Drivers are designed for use on any engine or multiple-tool lathe and for certain work on turret lathes and grinding machines. In addition to time-saving, the Seneca Falls Automatic Work Driver provides greater safety for the operator since there are no projecting screws or sharp corners to catch clothing or injure hands. Made in 18 standardized models for work diameters ranging from  $\frac{1}{4}$  to  $6\frac{1}{8}$  inches. Write for Bulletin D-13.

**SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.**



## AUTOMOTIVE INDUSTRIES . . .

*Is your News Magazine of  
Automotive and Aviation*

**MANUFACTURING**



**Wire wheel inserts are dressing up  
many of the 1953 models**

*-of course they're Stainless Steel*

WIRE wheels are one of the "hot items" in the automotive trade this year. Car owners like the distinctive look they give, and they are available for almost any car in the form of inserts like the one shown here.

As on so many other decorative members, straight-chromium Type 430 Stainless Steel is being widely used for wire wheels. Stainless Steel is strong yet light in weight; it resists corrosion; it's easy to keep bright and new-looking.

These qualities of Stainless Steel—so popular with owners—are the main reason why there's more straight-chromium

Stainless on the 1953 models than ever before.

New finishing facilities have helped to speed the switch to Stainless Steel for all types of exterior and interior trim. U-S-S 17 (Type 430) Stainless Steel, used extensively for these applications, is furnished in strip form with a bright mill finish that requires minimum polishing after forming, as well as in wire and other forms.

For the best performance, insist on U-S-S Stainless Steel. Our representatives will be glad to work with you in selection of materials and forming methods that best meet your design requirements.

UNITED STATES STEEL CORPORATION, PITTSBURGH • AMERICAN STEEL & WIRE DIVISION, CLEVELAND • COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO  
NATIONAL TUBE DIVISION, PITTSBURGH • TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. • UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS  
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UNITED STATES STEEL



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know about the  
*Moly-sulfide*  
LUBRICANT?**

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In one 40-page booklet we have collected 154 detailed case-histories describing how difficult lubrication problems have been overcome by molybdenum sulfide. If you wish to be up to date about this solid-film lubricant, write for a free copy now.

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AI-7

MS-3

**Landing Gear Strut  
for B-47 Bomber**

(Continued from page 96)

ognized as being a bar to normal production, and certainly an almost insuperable bottleneck in the event of a war economy.

These considerations led to studies on the part of Bendix engineers and production experts with the objective of developing some alternate design which would be just as acceptable functionally but easier and more economical to produce in quantity.

Suffice it to say that close cooperation among the interested parties, including the Air Force and Boeing Airplane Co., ultimately led to the acceptance of a Bendix design in which the two-piece alloy steel forging has been replaced by a one-piece aluminum trunnion forging, Fig. 2. It has resulted in lighter overall weight, less waste of critical materials, less machining, improved machineability, and what is of utmost importance — considerably less time required on Keller equipment.

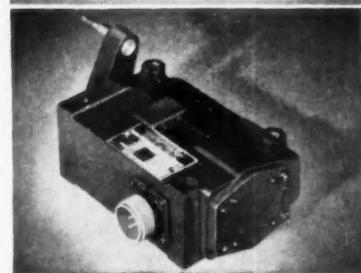
Looking at this problem more closely, consider the original alloy steel forging, Fig. 1. When made with best current closed die practice the weight of this forging, together with the outer cylinder sleeve, is 2124 lb. Some impression of the amount of machining required to get the assembly to finished size and dimensions may be gained from the fact that final weight is only 273.5 lb. Actually then, it was necessary to remove 1850.5 lb of steel in the form of chips. Not only does this represent time and labor and equipment but it involves the handling of 1850 lb of waste material which is converted to scrap.

Consider now the comparable figures for the one-piece alloy aluminum forging developed by Bendix. Total weight in the rough is 771 lb, down to almost one-third of the weight of the steel forgings. After machining, the weight of the trunnion is brought down to 225.5 lb. The total amount of waste material converted to chips now is but 545.5 lb, as compared with 1850 lb for steel. With the aluminum forging the utilization is close to 30 per cent of rough weight as compared with but 13 per cent for steel.

The finish-machined aluminum trunnion, seen in Fig. 3, gives a visual impression of the amount of metal removal when compared with the rough forging in Fig. 2.

In addition to the economies made

**Airborne's  
MAGNETIC  
BRAKE  
Now speed governed**



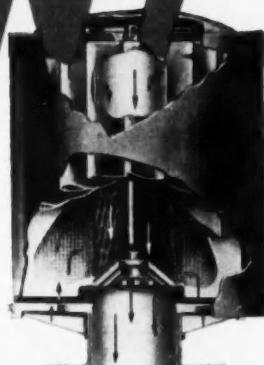
Airborne's geared magnetic brake is now available with an integral centrifugal brake to limit its speed and prevent overshooting. Designed to maintain any position within its travel range, the Model R-460 brake will hold a 200 lb. in. load, yet operate at less than 3 lb. in. when energized. A typical application is the centering adjustment of the bungee in the flight control system of a Piasecki Helicopter.

Small size and weight (2.3 lb.) make this brake unusually well suited to most aircraft. See the I.A.S. Aeronautical Engineering Catalog for dimensions of the R-460 or write us your requirements.

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ACCESSORIES CORPORATION

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# MOST EFFICIENT FILTER MONEY CAN BUY!



MODEL D  
Intake Filter

STAYNEW  
INTAKE FILTERS



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Representatives in Principal Cities

ALL TYPES OF FILTERS  
FOR EVERY INDUSTRIAL NEED

WHEN BUYING INTAKE FILTERS, you look first for efficiency. And, in Staynew Intake Filters, your dollars buy the **MOST EFFICIENT INTAKE FILTER MADE!**

They're *dry* . . . absolutely no oil carry over and no oil blow out on free air unloading equipment. They provide *maximum filtering area* in the smallest possible space. And they are *rugged*! Even under the most severe conditions Staynew Intake Filters perform a year or more *without attention*.

Get all the facts, and you'll buy Staynew Dry Type Intake Filters for the life of your engines.

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## O & S SELF-LUBRICATING BEARINGS



WRITE TODAY FOR  
LITERATURE OR SEND  
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**O & S** BEARING & MFG. CO.

777 W. EIGHT MILE ROAD • WHITMORE LAKE, MICHIGAN

NeverOil  
SINCE 1913

possible by the use of the one-piece aluminum trunnion design, there is another noteworthy benefit. The aluminum trunnion assembly weighs 49 lb less than the steel trunnion when the saving in weight of some smaller elements is considered. Every pound of saving in a retractable landing gear represents an important gain in the overall weight of the airplane and a 49 lb weight saving is considered impressive.

Figure 4 shows the current B-47 front strut being produced by Bendix, featuring the one-piece aluminum trunnion. Incidentally, some idea of the size of this assembly may be gained from the fact that the trunnion discussed here is about 47½ in. wide from tip to tip.

Bendix is carrying on further studies while production is continued and anticipates some additional improvements of note in the near future. At the present time the 14 ST aluminum alloy is being used for the trunnion forging. Experimental work is underway to explore the possibility of using the 75 ST alloy which has higher physical properties and could make possible a still further reduction in weight.

While it is not feasible to quote exact figures as to cost saving, Bendix estimates that the present aluminum trunnion can be produced for about 40 per cent less than the steel assembly it replaced.

### Shot Peening in Gear Design

(Continued from page 69)

eration than the same gears non-peened. Both of the cases cited above are related to carburized and hardened gears.

In most cases of shot peening in production of gears, peening is the last operation insofar as the teeth are concerned, and no attempt is made to protect the tooth profiles from the blast. However, in some cases the gears are cut with a protuberance hob to provide an undercut at the roots of the teeth. The gears are then hardened, shot peened and ground. In large gears, this procedure allows the tooth profiles to be ground without removing any of the shot peened surface in the fillet where the bending stress is maximum. This provides a means of overcoming distortion in heat treatment, and also a ground profile where this is considered essential.



**NEW**



# SILICONE RUBBER COMPOUND

for electrical and mechanical applications

#### SE-100 COMBINES

- Outstanding heat resistance
- Outstanding electrical properties
- Outstanding physical properties
- Ease of application

You can now extend equipment life and minimize insulation failures by specifying General Electric's new silicone rubber compound, SE-100.

SE-100 may be coated on glass or organic fabrics for service at high or low temperatures or where resistance to weather, ozone, corona or chemicals is required. In addition, SE-100 is available as a dispersion (SE-100S) and may be used to encapsulate coils and components for electrical insulating purposes.

#### SUGGESTED USES

**Electrical:** Cloth, tape and sleeving; coating for glass-serve wire; encapsulating coatings.

**Mechanical:** Ducts and tubing; gaskets and seals; diaphragms.

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##### Typical properties of glass cloth coated with SE-100:

Dielectric strength, volts/mil.....	1200-1400
Power factor, 60 cycles	
85 F .....	0.0110
212 F .....	0.0072
Tensile strength, lbs./in. width.....	150
% Moisture absorption, 96 hrs.....	0.11
Serviceable from .....	-76 to 480 F

**G-E silicones fit in your future**

**GENERAL ELECTRIC**

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Waterford, New York

Please send me product data on SE-100, list of fabricators, and a free copy of *G-E Silicones for Industry*.

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(In Canada, mail to Canadian General Electric Company, Ltd., Toronto.)

## METALS

(Continued from page 94)

52,762 tons, scarcely 10 days' supply at the May rate of shipments.

This would indicate a strong statistical position if there were not considerable worry over fabricators' inventories and, of course, the wholly unknown figure of dealers' inventories of copper goods. Not too much comfort was derived from the latest figures from the brass and wire mills.

At the end of April fabricators' stocks were up to 342,771 tons, the highest total for three years. They have increased over 100,000 tons in less than a year. At the same time copper stocks abroad showed an uncomfortable increase and deliveries to consumers declined, which explains the continuing large imports of the metal and brings the time nearer when Chile must bow to the inevitable and reduce its price of 36½ cents per lb to a more realistic level. The effect of such a move by the Chilean Gov-

ernment could hardly fail to cause a reduction in the world price below the 30 cent level.

### Lead Producers Are Cheered

Business is good in lead. The fifth price advance to 13½ cents per lb from the year's low of 12 cents, all within ten weeks' time, did nothing to curb buyers' interest, as lead is not essentially a military metal. The strength in the market is attributed to excellent demand from the battery manufacturers, who have been doing exceptionally well, thanks to the record automobile output. Larger tonnages of lead have been taken by the cable makers and producers of tetraethyl lead gasoline have been large buyers.

On the production side a short-lived strike at four large Mexican mines caused a loss in lead and zinc output. While the monthly rate of lead imports still is large, it is less than the average of 1952. London speculators have reportedly been caught in a squeeze play and in mid-June the British price was higher than the New York equivalent. Reflecting low prices for lead and zinc, some mining companies have flatly refused demands for wage increases and countered with a proposal for a 10 per cent cut. This appears to have cooled the ardor for a strike.

### Zinc Consumption Is Large But Price Disappoints

About the best that can be said for zinc is that apparent consumption of the metal, as measured by deliveries to users, continues extraordinarily heavy. May shipments totaled 84,250 tons which compares with an average of 74,700 per month in 1952. Stocks of slab zinc in the hands of smelters were slightly lower at the end of May after reaching a peak in March of nearly 100,000 tons. Imports while still high appear to be declining.

Mine production of zinc is estimated to be off about 20 per cent in this country and Canadian mines are likewise affected. Thus it is difficult to explain the continued high rate of smelter production, which averages about 82,000 tons per month, a little more than the monthly average last year. Quite likely the smelters are drawing heavily on inventories of concentrates and sooner or later their output will drop reflecting lower current intake of concentrates from the mines.

After falling to 11 cents per lb

**BALLS FOR BEARINGS  
AND OTHER BALL APPLICATIONS**

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PRECISION  
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Precision balls made for your job — available in a variety of materials. Your specifications will receive prompt attention in our Engineering Department. We are thoroughly experienced in supplying the automotive industry with special bearings, retainers and balls. Let us give you our recommendations.

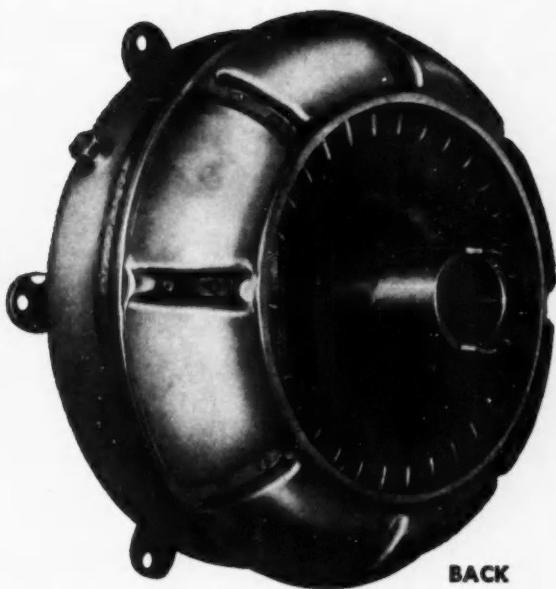
2HS 50

**THE HARTFORD STEEL BALL CO.  
HARTFORD 6, CONN.**

DETROIT W. S. TURNER CHICAGO VICTOR N. CLARK NEWARK, N. J. GUARANTEE TRUST BLDG. LOS ANGELES, CAL. E. O. MALTBY CO. EXPORT  
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FRONT



BACK

Converter is easily adapted to most power units. Made almost entirely from stampings for low-cost production.

Welded for strength, with leak-proof construction. Designed for direct air-cooling, but oil cooler may be added.

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Designed and built to hold *your* costs down in most applications. Long Torque Converters are now in high-volume production for passenger car use. Easily modified for many industrial uses. We are glad to provide engineering cooperation, through to a satisfactory installation, to manufacturers of original equipment. For complete information manufacturers in volume production should address:

### For Automotive and Industrial Applications:

- Eleven and 12-inch diameters.
- Ninety to 200 lbs.-ft. torque.
- Torque ratios at stall, 2.1 to 1.
- Efficiencies over 90%.

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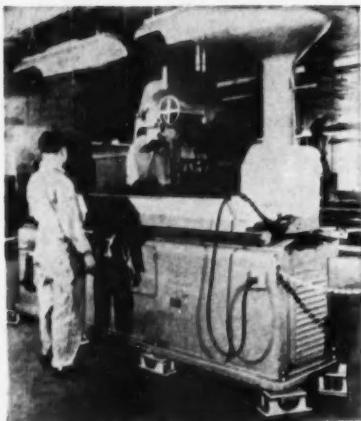


TORQUE CONVERTERS • CLUTCHES • RADIATORS • OIL COOLERS

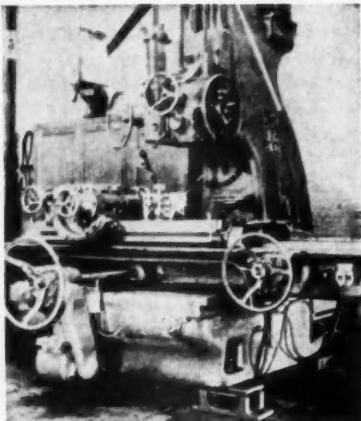
# STOP VIBRATION

WITH

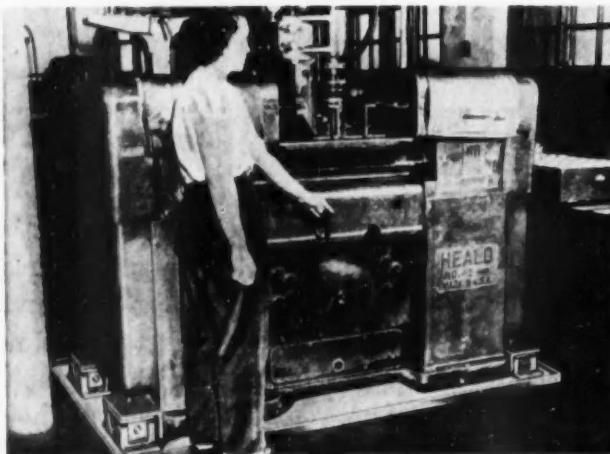
## KORFUND VIBRATION CONTROL



This Thompson 12" x 60" Surface Grinder is installed at Firth Sterling, Inc., Pittsburgh, Pa. Vibration from grinders affected precision testing equipment on floor below; vibration and noise was also extremely annoying in executive, sales and laboratory offices. Korfund Isolators directly under the grinders, completely solved the problem. Korfund Units stop vibration and insure quieter machine operation.



This Pratt & Whitney #38 Jig Borer is installed at Caterpillar Tractor Co., Peoria, Illinois. Korfund Vibro-Isolators protect this precision machine against severe external vibration from trucks and trains which had made accurate work impossible. Isolators are set in pockets made by removing wood block flooring. Korfund Units stop vibration and reduce rejects—improve work quality.



This is one of the Heald #49 Bore-Matics installed at Thompson Products Co., Cleveland, Ohio. Shock transmitted from one automatic boring machine to another caused intermittent skips and gouges. One machine had to be kept idle until both were mounted on Korfund Isolators. Now they operate together and turn out perfect work. Korfund Units stop vibration and increase production.

**Korfund Vibration Control** also: permits more efficient plant layouts, decreases original building and foundation costs, permits installations without reinforcement of floors, reduces machine maintenance costs, and lengthens machine life.

Standard Korfund Isolators are available for most applications. A Selector Chart giving recommendations for both normal and critical conditions is available. See Sweet's Catalog Files or write us for Bulletin No. 5.

For specific recommendations, contact us or your local Korfund office. A half century of experience is at your disposal.



48-82A Thirty Second Place, Long Island City 1, N. Y.  
In Canada: 510 Canal Bank, Ville St. Pierre, Montreal

early in March the zinc price has remained unchanged up to mid-June. The London quotation is consistently below the New York equivalent. In spite of official assertions that sales of the heavy British stocks would be made in an orderly manner, it is thought there has been considerable leakage that weakens the market.

### Prices Decline for Tin and Tungsten Ore

A probable end of the Korean conflict had an unsettling effect on the markets for tin and tungsten ore, both of which should be in easier supply if more peaceful conditions prevail in the Far East. Tin production continues to exceed consumption and the price trend is downward. The Bolivian Government has concluded an arrangement with Great Britain to sell tin to the Harvey smelter on the same basis as before the revolution.

The price of tungsten ore abroad has continued to fall and is now quoted at \$41 per unit WO3. This compares with a fixed price of \$63 guaranteed to domestic producers until 1956 by Washington. Under the stimulus of this price U. S. production has climbed rapidly over prewar, and it appears certain that sufficient tungsten will be available for all normal needs.

### BOOKS ...

**PRODUCTIVITY AND ECONOMIC PROGRESS**, by Frederick C. Mills, published by National Bureau of Economic Research, 1819 Broadway, New York 23, N. Y. Price, \$0.75. Over the last half century the real national product of the U. S. increased five times, while population doubled. This was the basis of a substantial advance in economic power and in levels of consumption. Over this same period the total volume of human effort going into production (measured by manhours of labor input) increased by 80 per cent. The great gain in total output was won with an increase in labor input well below the increase in population. The major instrument used in the winning of these dual gains was increased productivity. The movements thus briefly summarized reflect four basic trends in the growth of the economy of the U. S. and are examined in the pages of this pamphlet. An attempt is made to determine the magnitudes of some of the elements of growth, to outline the uses to which the U. S. has put its expanding productive power, and to define some aspects of the pattern of progress over the past 50 years.

**PROGRESS IN PRODUCTIVITY AND PAY**, published by The Eddy-Rucker-Nickels Co., Harvard Square, Cambridge 38, Mass. Price, \$2.50. Covering all U. S. manufacturing combined from 1914 to 1947, this booklet is a graphic history of the American production record. The text is illustrated throughout with charts to illustrate the points made.

# FOR EXTRA HEAVY DUTY

## SPECIFY VELVETOUCH

**ALL-METAL  
CLUTCH PLATES  
FACINGS AND  
BRAKE LININGS**

Whether you're designing the clutch for a twenty ton prime mover or the brake for a fractional horsepower motor, it will pay you to specify Velvetouch. Because Velvetouch is built for extra heavy duty service!

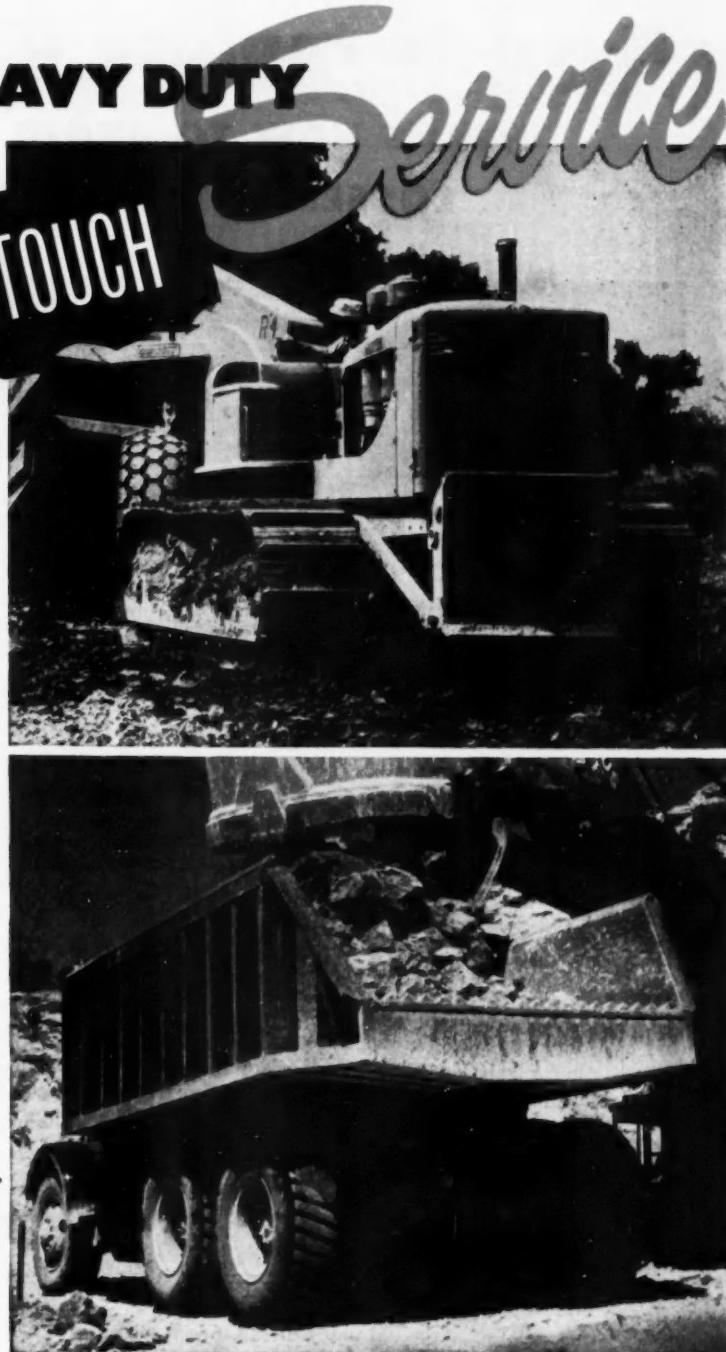
Unlike ordinary friction material, Velvetouch is made from powdered metals, compressed and fused to a strong steel backing plate. As a result, it runs cooler, lasts longer . . . can't deteriorate or burn like asbestos. And by changing the metal mixture, the friction characteristics of Velvetouch can be altered to meet specific clutch and brake requirements.

Our engineers will be glad to work with you in solving your friction problems. Just phone our nearest office, or write—

**The S. K. Wellman Co.  
200 Egbert Rd • Bedford, Ohio**



# Velvetouch

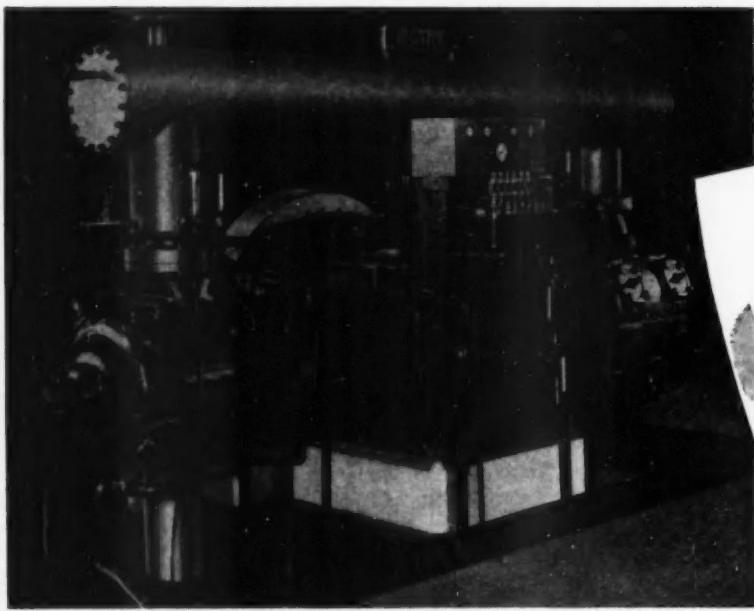


#### THE S. K. WELLMAN CO. SALES OFFICES AND WAREHOUSES

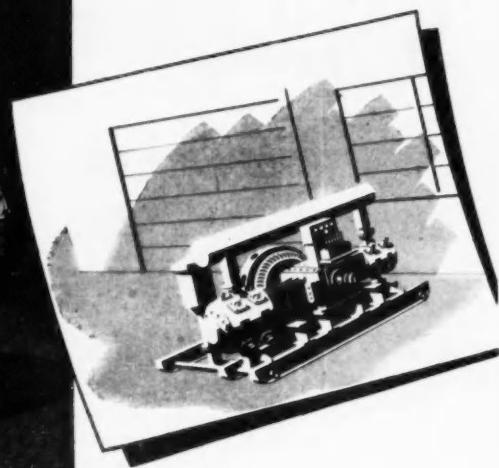
- \* ATLANTA - 119 14th St., N.E., Atlanta 5, Georgia
- \* CHICAGO - 1500 South Western Ave., Chicago 8, Illinois
- \* CLEVELAND - 200 Egbert Rd., Bedford, Ohio
- \* DALLAS - 2407 Main Street, Dallas 1, Texas
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- \*\* WASHINGTON - 1101 Vermont Ave., N. W., Washington 5, D. C.

# Need to replace a compressor?

## HERE'S HOW TO AVOID PRODUCTION LOSSES DURING CHANGEOVER



Clark 150 hp, CMA-2 Balanced/Opposed Motor Driven Compressor in a Pennsylvania metal forging shop.



Normally, replacing an old or inadequate compressor involves either serious losses in plant air capacity during changeover, or requires a building addition to house the new unit. Such dislocation and unnecessary expense can be avoided with a Clark Balanced/Opposed Compressor.

Because of perfect balance and overhung rotor construction, it's a simple matter to mount an average size Clark unit on a steel skid and operate it outside of the compressor building, while the old unit is being torn down and the foundation is completed for the new one. When ready to change over, the new unit is easily taken inside — skid and all — bolted down to the new foundation and tied in to the existing piping facilities. *A weekend is usually enough for the job!*

Furthermore, the compact design of the Clark Balanced/Opposed Compressor enables doubling — even tripling — air capacity, using the same floor area occupied by outmoded, inadequate compressors.

For air compressors within the 150-4500 hp range, write for Bulletin 118 or see your nearest Clark representative.

**CLARK BROS. CO., OLEAN, N. Y.**

Division of Dresser Operations, Inc.  
Sales Offices in Principal Cities Throughout the World

PRECISION BY THE TON

**CLARK**

**balanced/opposed  
compressors**

## SHELL MOLD DEVELOPMENTS

(Continued from page 66)

and deluged with samples, choose several from reliable producers for consideration. A small experimental pattern will probably be available by this time and the best method of evaluating resins is to use the manufacturer's recommendations and make shells. By the time five or six binders have been evaluated in this manner, the operator will have gained considerable knowledge about the application of resinous materials. A tentative choice should be made and production started. Once under way, the more detailed testing program may begin, starting with the chosen resin. When test data are available on this material, other resins may be given a thorough evaluation and several sources of supply assured.

The flexural and tensile tests offer excellent control methods for the shell molding foundry. These strengths vary considerably with resin content and are dependent upon sand fineness, mixing efficiency and other process variables. The determinations may be made quickly by control laboratory personnel and require simple equipment. With proper control of the test procedure, good control charts can be constructed and once the limits within which the molding mixture may fluctuate have been determined, anomalies may be discovered before production is effected.

### Casting Magnesium in Shell Molds

By Nicholas Sheptah  
Dow Chemical Co.

A small magnesium production casting which had been made in green sand and permanent molds was made in shell molds to try to obtain a comparison of the three molding methods.

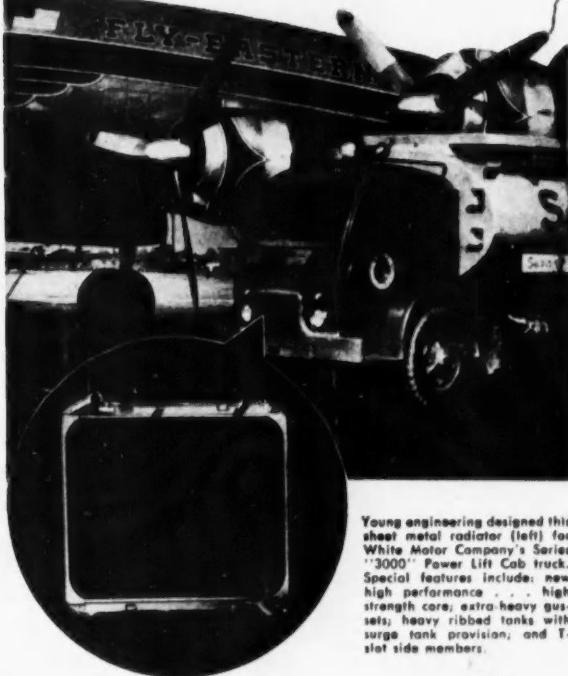
Magnesium pattern plates were made to produce the shells for the production casting. A urea formaldehyde-bonded conventional core was used with the shell molds to produce the casting. The shell molds were made with a five per cent phenol formaldehyde, 95 per cent silica sand of A.F.S. grain fineness No. 90, a mix to which  $\frac{1}{2}$  per cent ammonium borofluoride was added. The shells were assembled with bolts and clamps and backed with dry heap sand, then poured with AZ92A alloy at 1450 F.

Five castings made in shell molds were given a solution heat treatment at 770 F for 16 hr and were aged at 425 F for five hr with five castings each produced in green sand and permanent molds. Test bars were cut from each of the castings and were radiographed prior to being tested in tension. The fractures of the tested bars were examined and the bars were then studied metallographically.

The tensile properties of the castings produced by shell molding, green sand molding, and permanent molding are listed in Table I. The shell molded

(Turn to page 140, please)

## modern cooling for modern equipment



Young engineering designed this sheet metal radiator (left) for White Motor Company's Series "3000" Power Lift Cab truck. Special features include: new high performance . . . high strength core; extra heavy gussets; heavy ribbed tanks with surge tank provision; and T-slot side members.

For twenty-five years Young has been engineering and building automotive heat transfer products. Many of the nation's leading manufacturers of trucks, buses, Diesel locomotives and stationary engines, compressors, road building and agricultural machinery—equipment that requires rugged radiators and special attention to capacity—assign Young Engineers to develop the cooling system.

Whatever the capacity required, Young has either a standard unit—or the ability to design one—capable of delivering the most heat transfer per pound of product. May we assist you in your requirements?



#### ATTENTION AIRCRAFT DESIGNERS!

Check with Young's Engineering Staff for the latest in Heat Transfer: Air to air; gas to air; oil to air; water to air; and oil to fuel.



# YOUNG

Heat Transfer Products for Automotive and Industrial Applications.

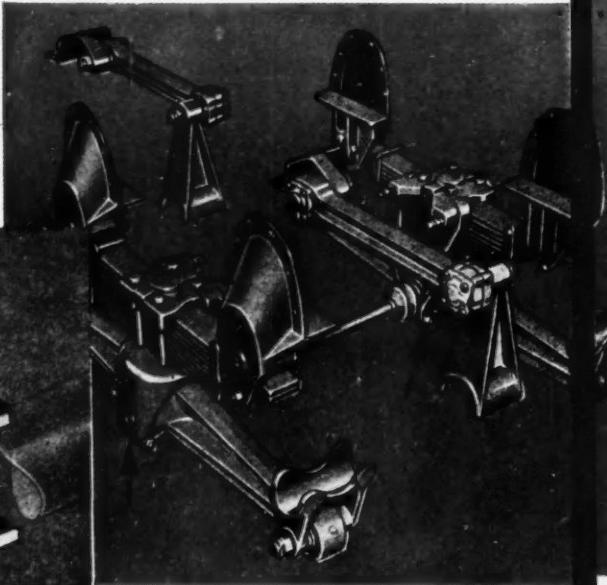
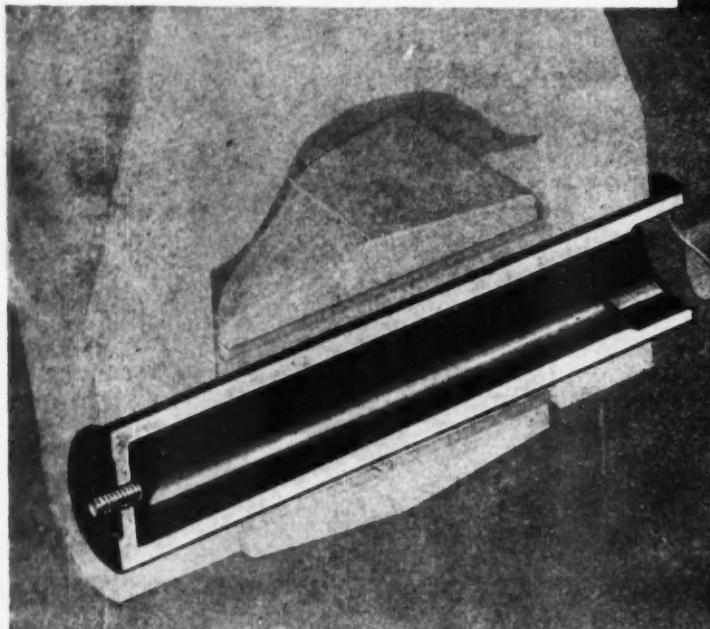
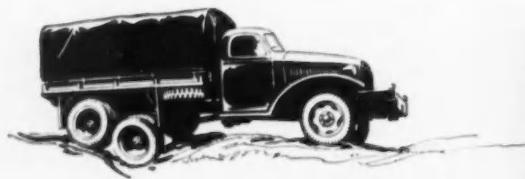
Heating, Cooling, Air Conditioning Products for Home and Industry.

**YOUNG RADIATOR COMPANY**

Dept. 103-G • RACINE, WISCONSIN  
Factories at Racine, Wisconsin and Mattoon, Illinois

# Mullins Steel

*made this part in one piece...*



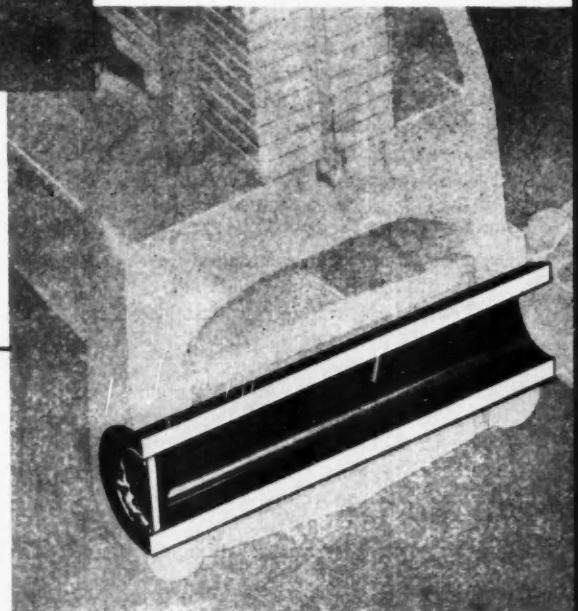
This truck manufacturer realized substantial savings by using torsion shells made by the Mullins Steel KOLDFLO Process in the tandem-axle assembly.

## Mullins Steel *Koldflo* Process

produced this torsion shell in one piece with integral leakproof bottom. The shell, used in the axle assembly of a large manufacturer, comes from the presses with the smoothness, hardness and precision required. Concentricity between inside and outside diameter was held to 0.010-inch. All these features are acquired in the Mullins Steel KOLDFLO Process from low-carbon steels.

## Old Way

This torsion shell was formerly made from cold-drawn seamless steel tubing which involved expensive processing before it could be used in assembly. The tubing had to be machined, heat-treated and ground after the bottom had been welded in.



# Koldflo Process

## ...cut production costs

This torsion shell, used in a tandem-axle assembly by a leading truck manufacturer, was made in one piece by Mullins Steel KOLDFLO® Process.

This process cut production cost by eliminating such costly operations as machining, heat-treating and grinding after the bottom had been welded in. Mullins Steel KOLDFLO Process makes a wide variety of other products formerly made by more expensive casting, forging and machining processes.

The Mullins Steel KOLDFLO Process is completely and exclusively different from any other extrusion process. The finished products come from the presses with smoothness, hardness, strength and precision required, and all of these features are acquired in the process from the use of low-carbon, low-cost steel.

The process can better and more economically make a wide variety of finished products. And the larger the part, the greater the savings.

The new and expanded facilities for commercial use make possible the production of cold-formed, hollow parts into finished shapes and a wide variety of configurations and are in lengths from 6" to 36" and in diameters from 2" to 5".

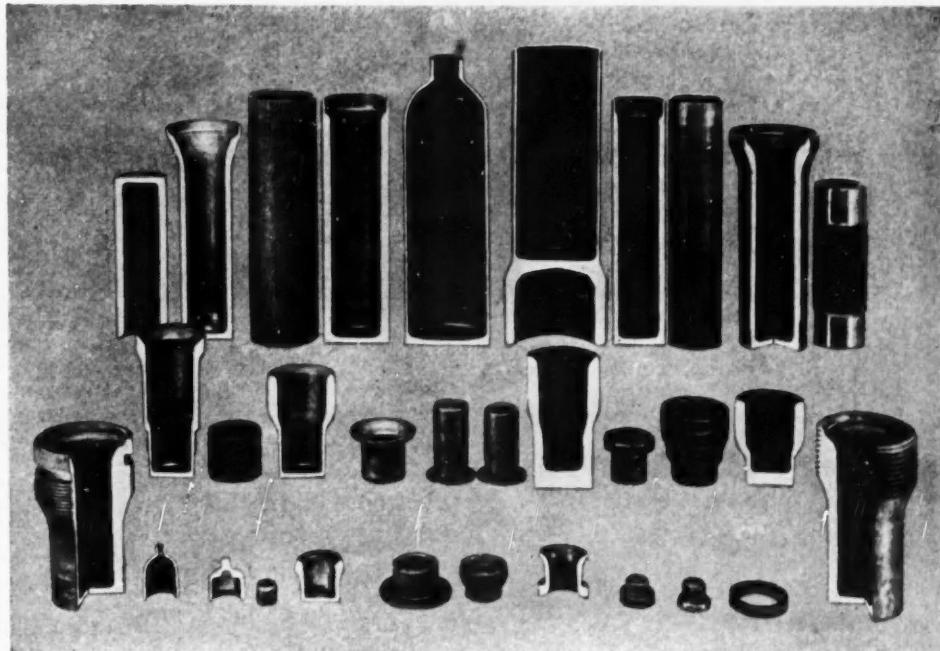
Because the Mullins Steel KOLDFLO Process is so new, the question "What is KOLDFLO?" has been asked us many times. To answer this question, we have prepared a booklet entitled "Product Design Guide."

This Design Guide will be valuable to executives, engineers and designers in studying the cost-saving possibilities of this process.

*Koldflo* Division  
MULLINS MANUFACTURING CORPORATION  
SALEM, OHIO

\*KOLDFLO is a trade-mark of Mullins Manufacturing Corporation

Send today  
for your free  
copy of  
"Product  
Design Guide."



These parts have already been produced and hundreds of other similar parts can be produced by the Mullins Steel KOLDFLO Process with a definite savings in steel, manpower, machine tools, plant space and dollars.



absolute). Available temperature range is from + 200°F. to -100°F. Relative humidities range from 20% to 95% at above-freezing temperatures and are limited by the minimum and maximum dew points of 33°F. and 178°F., respectively. Temperature control is held within  $\pm 2^{\circ}\text{F}$ .

Standard equipment includes electric temperature and humidity recording controllers, altitude gauge, mercury manometer, 8-post terminal panel, and pre-set control for maintenance of altitude. Special features may include high-voltage lead-ins, side viewing windows, hand-operated tuning shafts, high wattage dissipation, utility ports up to 6" diameter. Also stainless steel power shafts, special instrumentation, rapid cooling and heating rates, low temperatures to -150°F., altitudes to 120,000 ft. Also custom-size chambers.

For further information write:

**Tenney**  
ENGINEERING, INCORPORATED  
Dept. X, 26 Avenue B, Newark 5, N. J.

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Los Angeles Representative: GEORGE THORSON & CO.  
Engineers and Manufacturers of Automatic Environmental Test Equipment

## CARS ON CREDIT

(Continued from page 53)

billion dollars in automobile instalment credit outstanding.

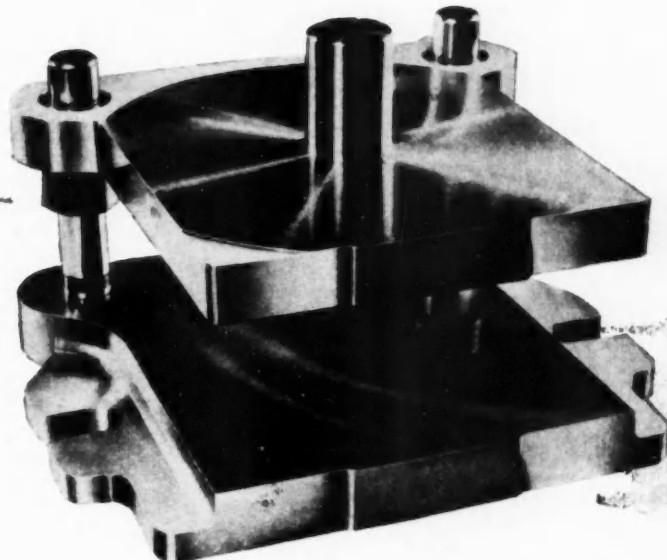
The most striking development which has occurred in automobile instalment financing during the past two decades has been the growth in commercial bank activity in this field. In 1939 bank holdings of car loans amounted to only 44 per cent of the holdings of sales finance companies. By 1941 this proportion had increased to 55 per cent, and in the postwar period automobile instalment loans of banks have been roughly equal to those of sales finance companies.

The greater importance of banks in the automobile instalment loan field since the war reflects both the growing number of banks which engage in this type of lending as well as efforts on the part of some to increase their volume of business. Most banks now do some instalment lending, and many have set up personal loan departments and aggressively compete to purchase instalment paper from automobile dealers. There are several reasons for the increased interest of bankers in the instalment credit business. First, it serves as an additional outlet for funds in the bank's own community. Second, when run as a specialized operation and on a volume basis, automobile instalment lending has proved more profitable than many other types of bank loans and investments.

### Finance Company Financing

Sales finance companies have been specialists in automobile instalment financing for many years. The bulk of the business is done by several very large national companies, but hundreds of smaller firms operate successfully on a regional or local basis. In recent years the losses experienced on instalment credit have been relatively low, and sales finance companies have realized very favorable profits. In 1951, for example, a sample of companies reporting to the First National Bank of Chicago showed net profits after taxes averaging 15 per cent of net worth and net losses equal to less than one-half per cent of the instalment credits fully paid down or otherwise liquidated during the year.

The funds with which sales finance companies operate come from several sources and are relatively flexible in



## DANLY DIE SETS

*help build the mighty Cat Diesel Tractor*

You can trace the mountain-moving brawn of the famous Cat-built Tractors right back to the production line . . . and to Danly Die Sets. Caterpillar Tractor Co. uses Danly Die Sets as a precision base for many die-making operations . . . depends on them to help maintain uninterrupted production schedules.

Danly Die Sets save countless hours in the die shop . . . make tooling-up much faster — easier too. Why not bring Danly Die Sets into your production picture? . . . get the kind of die performance you're looking for.

Remember — there's a Danly Branch near you.  
Service is fast . . . convenient.

**DANLY MACHINE SPECIALTIES, INC.**

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DIE SETS . . . STANDARD OR SPECIAL  
DIEMAKERS' SUPPLIES

CHICAGO 50	2100 South Laramie Avenue
'CLEVELAND 14	1550 East 33rd Street
'DAYTON 7	3196 Delphos Avenue
'DETROIT 16	1549 Temple Avenue
'GRAND RAPIDS	113 Michigan Street N.W.
'INDIANAPOLIS 4	5 West 10th Street
'LONG ISLAND CITY 1	47-28 37th Street
'LOS ANGELES 54	Ducommun Metals & Supply Co. 4890 South Alameda
MILWAUKEE 2	111 East Wisconsin Avenue
'PHILADELPHIA 40	511 W. Courtland Street
'ROCHESTER 6	33 Rutter Street

\*Indicates complete stock

**Got A Hard-To-Reach Place**

**WHERE YOU  
HAVE TO PUT A NUT?**

**use**

# **MIDLAND** ***Welding Nuts***

Midland Welding Nuts anchored\* to parts in inaccessible places eliminate the need for holding them while attaching other parts.

**\*THIS IS ALL YOU DO**—Just insert collar of Midland Welding Nut in hole for bolt or screw, resistance weld the Nut in place, and the Nut is there for the life of the job. Nuts can be automatically fed to the welder. Speed your production . . . save money,



## **The MIDLAND STEEL PRODUCTS COMPANY**

**6660 Mt. Elliott Ave. • Detroit 11, Michigan**  
Export Department: 38 Pearl St., New York, N. Y.

**Manufacturers of**

AUTOMOBILE AND  
TRUCK FRAMES

AIR AND VACUUM  
POWER BRAKES

AIR AND ELECTRO-PNEUMATIC  
DOOR CONTROLS

amount. Long-term capital is supplied through investments of stockholders, including retained earnings, and also through the sale of junior debenture bonds, principally to insurance companies. The major portion of sales finance company funds, however, are obtained on a short-term basis, in the form of borrowings from banks and also from the sale of three-to-nine month commercial paper in the open market. As of mid-1952, the sources from which investible funds had been obtained by companies in the First National Bank sample were as follows:

Bank loans .....	56%
Commercial paper .....	10
Unearned income and loss reserves .....	7
Long-term debt .....	11
Net worth .....	16
Total resources .....	100

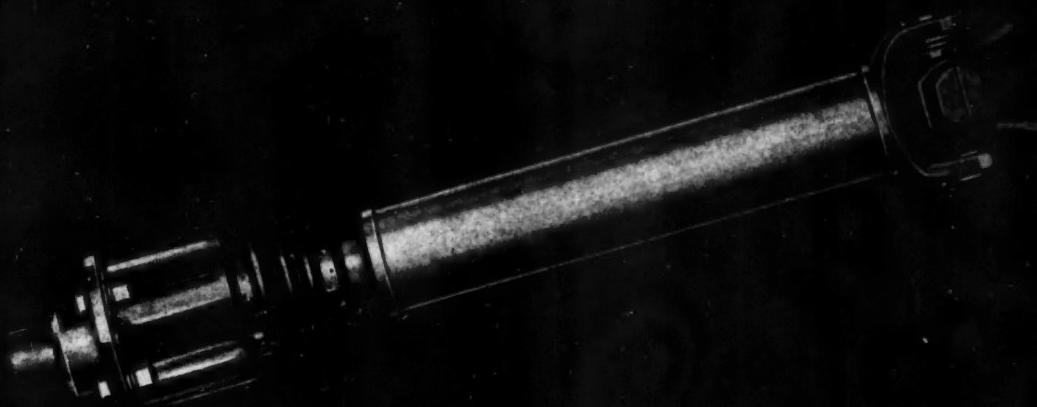
Operating so heavily on the basis of short-term borrowings, the possibility that sales finance companies might not be able to obtain sufficient funds to meet the potential demands of automobile credit buyers cannot be overlooked. No serious difficulties appear to have been experienced in providing for the rapid rise in instalment borrowing to date, however, and there would seem to be little reason for expecting sales finance companies to come into disfavor with lenders so long as currently high credit ratings are maintained.

One result of the competition among commercial banks and sales finance companies in making automobile instalment loans has been a general decline in interest rates charged. Whereas a six per cent rate per year on the original amount borrowed appears to have been customary before the war, loans at 4½ and five per cent are now generally available. In some areas, where competition has been especially vigorous, interest rates have fallen as low as 3½ per cent.

## **Prospects Are for Continued Growth**

The volume of automobile instalment credit extended, of course, is closely related to total sales of automobiles. Since dealers' sales are currently running well above a year ago and manufacturers plan to better last year's output by about a third, the demand for instalment credit is certain to continue high in the months ahead. Moreover, it seems likely that dealers, hard-pressed to sell the large volume of new cars produced and used cars traded in, will exert strong pres-

# *Eliminate Spline Friction*



*with "DETROIT'S" Exclusive  
Universal Joint Combinations*

A smoother car ride and longer drive train life are assured by "DETROIT'S" exclusive universal joint combinations. This is accomplished because slip motion, angular motion and length changes are permitted with no spline friction. Thus the thrust load on transmission and axle bearings is reduced to an absolute minimum.

**DETROIT**  
**UNIVERSAL JOINTS**



UNIVERSAL PRODUCTS COMPANY, Inc., Dearborn, Michigan

sure on lenders to ease credit terms further.

There seems little doubt that the funds needed to finance those credit buyers who meet reasonable risk standards will be forthcoming. Commercial banks can shift a somewhat larger proportion of their resources into this growing field of credit if they so desire, and at least the larger sales finance companies clearly have not exhausted their ability to borrow.

But whether credit terms will be allowed to ease further is another matter. Lenders are subjected to two

opposing forces in this respect. On the side of more liberal terms is the desire to meet competition and maintain or increase the share of available business obtained. On the side of greater caution is the possibility that delinquencies and repossession will rise, which would both cut down on profits and tend to engender customer ill will.

Delinquencies have been relatively low in the postwar years of good business, high income, and full employment. Moreover, there appears to have been little increase in delinquencies in

the face of the rise in borrowing during the past year. Banks reporting monthly to the American Bankers Association indicate that delinquencies of 30 days or more at the end of February were only slightly higher than in early 1952 and fully a third lower than at the beginning of 1950. At the same time, however, lenders generally are aware that they are vulnerable to any downturn in business activity and employment which might develop. Therefore, it seems probable that most lenders will exercise caution in their selection of risks and will generally hold the line on credit terms, particularly since the demands for instalment credit will be large in any event.

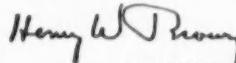
*This article on instalment purchases of automobiles was published in a recent report by the Federal Reserve Bank of Chicago.*

## Manufacturers of... HARDENED and GROUND PARTS for over 40 years



SINCE the day of the duster and goggles, The Brown Corp. has meant highest quality precision parts for the automotive industry. Today, Brown Parts serve trucks, tractors, trailers, buses, axle builders, off-the-road machines and Diesel locomotives. The production methods and facilities we have developed are unexcelled—uniform product quality is assured—deliveries are reliable—service is efficient. Ask any of our long list of satisfied customers throughout the industry.

For further information about our specialized production of hardened and ground automotive and industrial parts, just drop us a note. We invite an opportunity to quote on your work.

  
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Parts include . . .  
King Pins  
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Shackle Pins  
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. . . anything in the hardened and ground line, of any analysis steel, up to 4 1/4" diameter.

# THE BROWN CORP.

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C. H. Ehret, 3407 Clarendon Rd., Cleveland • N. F. Spring, 4716 Ballou Rd., Detroit • R. C. Sanderson, 5609 N. Clark St., Chicago • Harry J. Windmiller, 1704 Carlton, Fort Worth • Johns William & Co., 1440 N. Spring St., Los Angeles, Calif. • John B. Hunt, 5611 S.E. Yamhill St., Portland, Ore.

## Mack Brings Out New Diesel Engine

(Continued from page 98)

retardation, or braking, effect of the engine.

The Mack Synchrovance also is incorporated in the Thermodyne Diesel. The Synchrovance automatically advances or retards injection timing according to the engine speed, eliminating premature firing at slow speeds and providing maximum advance as speed increases. Smooth-running, full power development and economy are claimed as a result. In addition, easy starting is greatly facilitated.

The seven-bearing crankshaft is fully counterbalanced by 12 integrally-forged counterweights. Its journals are induction case-hardened, and journal fillets are pre-stressed by roller burnishing to increase surface strength and prolong crankshaft life. Torsional vibration is absorbed by an improved viscous-type damper.

Connecting rods have caps split at a 35-deg angle to accommodate three-in. crankpins and still permit withdrawal through the cylinder bores. Mating tongue-and-groove surfaces lock the caps positively and relieve the retaining capscrews from shear.

The new Thermodyne Diesel is manufactured in Mack factories, specifically for installation in Mack vehicles, and is offered in truck and tractor models of the LJ series, H series, W series and B-61 series.

**A**mong the many contractors who make these 50 caliber, 60 caliber and 20 m/m brass and steel cartridge cases, a few use machines that are strictly special—designs that will be practically scrap value, so far as adaptability to other work is concerned, when the shell job is finished.

Many more millions of these shell cases are now being machined on

**Standard 6 Spindle ACME-  
GRIDLEY Bar Automatics**

Some of these standard machines are equipped with magazines loaded by hand, as on the job illustrated, others with fully automatic hopper feeds—reducing man hours to minimum.

And with simple carbide tools output is fast—in fact 1.5 seconds (2,400 per hour).

\* \* \*

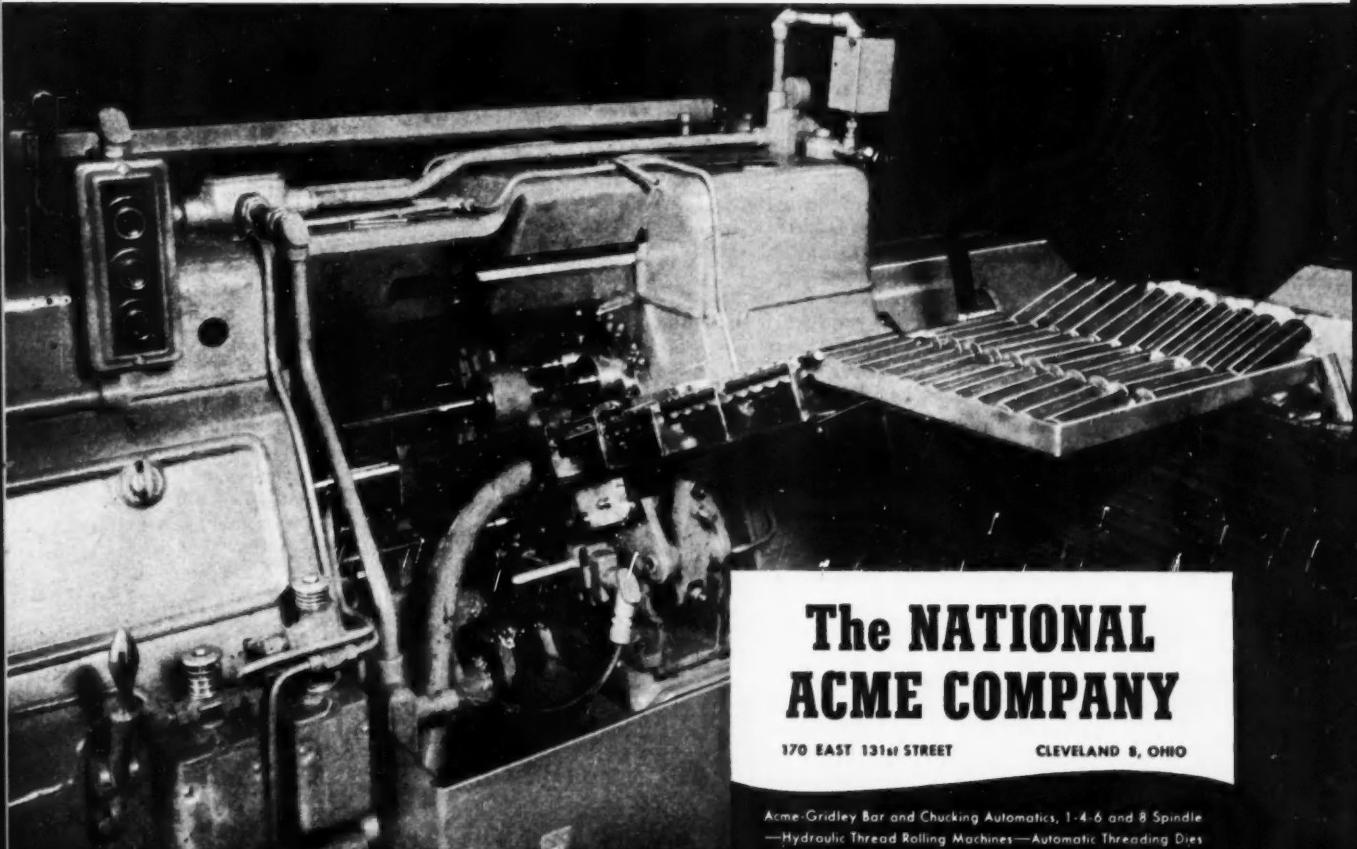
**WHAT'S THE PAYOFF?** Just this—when the job is done, Acme-Gridleys can quickly be retooled—good for years more service on peace-time parts production. Quite a difference in investment value and long terms profit.

Whatever your specific bar automatic needs today, consider also the value of these machines tomorrow—the importance of Acme-Gridley basic universal application and modern tooling ingenuity.

We've built more than 45,000 of them—in sizes up to 7 3/4" capacity.



*You can't do TODAY'S job... with YESTERDAY'S tools... and be in business TOMORROW*



**The NATIONAL  
ACME COMPANY**

170 EAST 131st STREET

CLEVELAND 8, OHIO

Acme-Gridley Bar and Chucking Automatics, 1-4-6 and 8 Spindle  
—Hydraulic Thread Rolling Machines—Automatic Threading Dies  
and Taps—Limit, Motor Starter and Control Station Switches—  
Solenoids—Contract Manufacturing.

# LEDEX ROTARY SOLENOIDS

...give positive, powerful snap action!



here's how a  
LEDEX ROTARY SOLENOID  
operates...

The magnetic pull moves the armature along the Solenoid axis. This action is efficiently converted into a rotary motion by means of ball bearings on inclined races. The inclined ball races are made to compensate for the magnetic pull increase as the Solenoid air gap closes, thereby providing substantially constant torque throughout the Solenoid stroke. The rotary snap-action power of the Ledex can be efficiently harnessed with a minimum of linkages, through the use of one or more standard features available on all models.

here's why LEDEX  
ROTARY SOLENOIDS  
are dependable!



As can be seen from the exploded view, Ledex Rotary Solenoids are simply constructed with few moving parts. All parts are manufactured to exacting tolerances and are carefully inspected and assembled.

The copper wire coil, the heart of the Solenoid, was developed especially for this product. It is wound by a precision winding process that puts a maximum amount of magnet wire into available space . . . giving tremendous power to compact Ledex Rotary Solenoids.

six basic LEDEX  
ROTARY SOLENOIDS  
to choose from!

Model Number	2	3	5	6	7	8
Diameter	1 1/8"	1 1/4"	1 1/8"	2 1/4"	2 1/2"	3 1/8"
Torque lb.-in. 1/4	1	5	10	25	50	
Weight lbs.	1/2	1/2	1/2	1	2 1/2	4 1/2

\*45° stroke intermittent duty.

Engineering data is available upon request.  
Write for descriptive literature today!

*J.H. Leland* INC.

123 WEBSTER STREET, DAYTON 2, OHIO

## A Comparison of Fuels in City-Bus Operation

(Continued from page 51)

tions of these fuels are given in Tables I, II, and III. Dispensing systems were available for the gasoline and Diesel fuels; however, new facilities had to be installed for the storage and dispensing of the LPG. The cost of this new installation was an extra item of expense for the operator.

### Fuel Cost

The following price of the fuels reflect some changes in price structure during the test program, those quoted were weighted according to the length of time used for a given period of operation. Included in the fuel costs are State and Federal taxes. LPG fuel costs are those prevailing in the Harrisburg area and they undoubtedly differ from LPG fuel costs in other parts of the country.

Gasoline	19.7 cts./gal
LPG	16.3 cts./gal
Diesel	17.6 cts./gal

### Lubricants

Lubricating oil quality was changed early in the test in that a motor oil below MIL2-104B quality was changed to an approved MIL2-104B quality. The cost of the motor oil was slightly in excess of 50 cents per gallon.

### Results

The average fuel consumption figures for the first and second years and the average fuel consumption for the test period follow:

Type of Fuel	Fuel Consumption		
	Avg. MPG 1st Year	Avg. MPG 2nd Year	Avg. MPG for Test
Diesel	5.65	5.53	5.59
Gasoline	4.10	3.94	4.02
LPG	3.37	3.35	3.36
LPG (conversions)	2.34	2.70	2.52

The average oil consumption figures are based on total oil added at the oil change periods plus make up. The gasoline and LPG oil change period was on a 6000 mile basis while the Diesel buses started out with a 3000 mile interval and were later changed to the 6000 mile basis. The oil consumption data are given below:

Type of Fuel	Oil Consumption—Avg. Miles/Qt		
	1st Year	2nd Year	Avg. for Test
Diesel	127	139	132
Gasoline	224	152	188
LPG	299	200	250

In summary, a comparison of gaso-

*Another new development using*

# B. F. Goodrich Chemical *raw materials*

AIR FORCE PHOTO, HEADQUARTERS, U. S. A. F., WASH., D. C.



Valve made by Aero Supply Mfg. Co., Inc., Corry, Pa. Hycar rubber diaphragm molded by Vulcan Rubber Products, Inc., Brooklyn, N.Y. B. F. Goodrich Chemical Co. supplies the Hycar rubber only.  
1. Completely assembled shut-off valve as used in the B-47 Stratojet. 2. Hycar rubber diaphragm in partially assembled valve  
3. Hycar rubber diaphragms

## "Thinking" valve needs Hycar for fast, safe refueling!



GASOLINE flow into wing tanks of B-47 Stratojets and C-124 Globemasters sometimes reaches 600 gallons per minute.

Shut-off valves—with Hycar rubber diaphragms—meet every requirement of speed and safety. Valves are located in the wing tanks. They are actuated automatically to stop fuel flow before tank capacity is reached. If the valve's rubber diaphragm were to fail under the terrific pressure, fuel would overflow . . . the fuel tank might rupture . . . the entire wing structure might be damaged. You can see the important part the Hycar rubber diaphragm has

in successful refueling.

Hycar not only withstands extreme pressures, but also resists the deteriorating effects of aircraft fuel. It will not become brittle or crack with age. And Hycar also remains resilient and flexible through a temperature range required for this application of -65°F. to 167°F. The Hycar rubber is compounded to meet military specification MIL-R-6855, Class I.

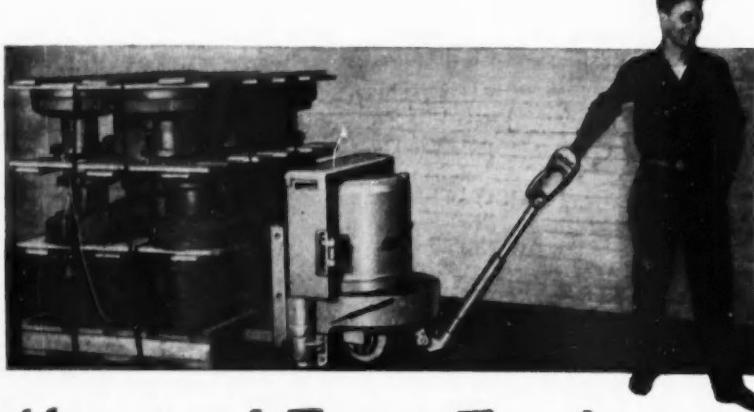
Hycar rubber compounds have many advantages, are used in many industries. They resist heat and cold, abrasion, aging, gas, oil and many chemicals. They may help you improve or

develop more saleable products. For information, please write Dept. HG-7, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

**B. F. Goodrich Chemical Company**  
A Division of The B. F. Goodrich Company

**Hycar**  
Reg. U. S. Pat. Off.  
*American Rubber*

GEON polyvinyl materials • HYCAR American rubber • GOOD-RITE chemicals and plasticizers • HARMON colors



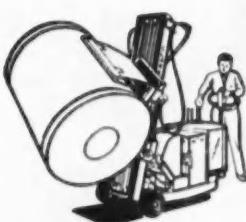
## HANDLE A THREE-TON LOAD With One Hand In Your Pocket... Use CLARK POWRWORKERS!

CAN'T YOU JUST PICTURE THIS MAN trying to pull this load with an old-fashioned manual hand truck! It's a cinch he wouldn't have a smile on his face—there'd be sweat and strain, because those transmission housings weigh pretty near three tons!

As a matter of fact, his boss is even happier. That POWRWORKER pallet truck has taken the muscle work out of the job, turned a tired worker into the smiling chap you see here. Furthermore, this employee is now doing twice the work he accomplished manually. No labor problem here! And the boss gets more effective use of his storage space, because the compact little POWRWORKER thrives on narrow aisles and low-load floors.

Not to mention the fact that the POWRWORKER is tailor-made for tight budgets. Big-truck benefits at small-truck cost—which means that nobody need deny himself the money-saving advantages of mechanized handling. Pound for pound, dollar for dollar, you can't beat the value in CLARK'S POWRWORKER Line.

Get the facts from your nearby CLARK Dealer (look under "Trucks Industrial", in the Yellow Pages of your phone book) or use the coupon below.



CLARK Attachments:  
22 basic models

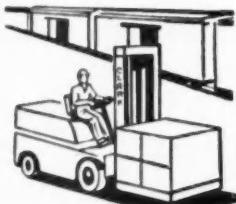
**CLARK** ELECTRIC, GAS, DIESEL, L.P. GAS  
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CLARK Electric Powered Fork Trucks:  
Capacities from 1000 to 7000 lb.



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Capacities from 1000 to 15,000 lb.

line, Diesel and LPG fuels has been made in new equipment designed for each fuel type and in a typical city bus fleet as represented by the Harrisburg Railways Co. operation. The data show that the Diesel fuel system is the most economical one to use. Gasoline is more economical than LPG; however, the differences between these two fuels is small. In order for gasoline to compete with Diesel fuel its price would have to be reduced nearly 40 per cent; the price of LPG would have to be cut about 50 per cent.

Substantially the greatest part of the total operating cost is fuel cost, hence the price per gallon is of major significance. This is particularly pertinent in the case of LPG as the cost to transport this product into this area raises its price over that for other areas. Where LPG avails are high and transportation cost is low, the LPG system would be economical to use.

The above is an abstract of a paper presented to a session on motor fuels during the 18th Mid-Year Meeting of the American Petroleum Institute's Division of Refining, New York, N. Y., May 14, 1953.

## BOOKS ...

MATERIALS HANDLING, by John R. Immer, published by McGraw-Hill Book Co., 330 W. 42nd St., New York, N. Y. Price, \$8.00. With the dual purpose of supplying a comprehensive text and a practical guide, this book not only describes specific methods of handling, but also illuminates the underlying characteristics common to many handling problems. It further offers an excellent survey of materials handling equipment from a new functional approach, simplifying application of equipment types for solving the engineer's immediate problems. The positive, practical, and realistic treatment is founded on a solid basis of the experience of experts from various industries. Consisting substantially of case histories, underlying principles of each are clearly delineated, and fundamental issues are ably defined. Thorough checking of each section by qualified experts and reinforcement of techniques by descriptions of companies and places of development or current use assure an authoritative result. With special emphasis upon the engineering and business aspects of the subject, the flow of the product itself is stressed. Attention is given to organizational problems which arise in the field, and research and advance are accorded a comprehensive survey. A section on special handling problems was especially developed. For the first time, motion and time study are considered a part of handling, and latest techniques are given application. An unusual section of analysis includes detailed presentation of types of analyses and surveys, as well as a thorough study of accounting aspects. Chapters on operator training and instruction, maintenance, and safety are included.

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# Observations

By Joseph Geschelin

## More Engines

Engines continue to hold the center of interest. Little is known about V-6's, insofar as the literature is con-

cerned, except for the fact that a number of companies are testing one form of V-6 or another. Last year rumors were frequent regarding GM's plans for a V-6. More recently, the issuance of a U. S. patent to GM on

V-6 design details at least confirms that where there is smoke there is some fire.

## Big Engines

Immediately after the war there was considerable activity in the development of free piston engines for larger outputs for use in conjunction with gas turbines. We understand that much work is underway although it remains unpublicized. While in Italy recently we learned at first hand that one of the automotive companies has taken an interest in a European free piston engine and has some competent people studying it.

## Dielectric Baking

A recent report from Allis-Chalmers comments on a dielectric core drying installation now in use in a large aluminum foundry. Operating on a modified Hartley oscillator circuit, this type of core drying equipment is recommended for the curing of intricate cores having variations in cross-section which, normally, would be difficult to handle by conventional methods. The latest installation was designed specifically for handling cores for jet engine components.

## Standard Fits?

ASA is persistently following its long range project of an American standard for recommended fits between cylindrical parts. According to a recent report by John Gaillard, an ASA committee has set out to canvass industry to find out whether industry really wants an American standard; and if so, whether tables based on the proposed ABC System will be acceptable. This is the time for industry to decide and speak up.

## Heat Capacity

Now that science and industry are employing heat measurements toward the extreme end of the temperature scale, the National Bureau of Standards is developing a new standard of heat capacity for use at temperatures

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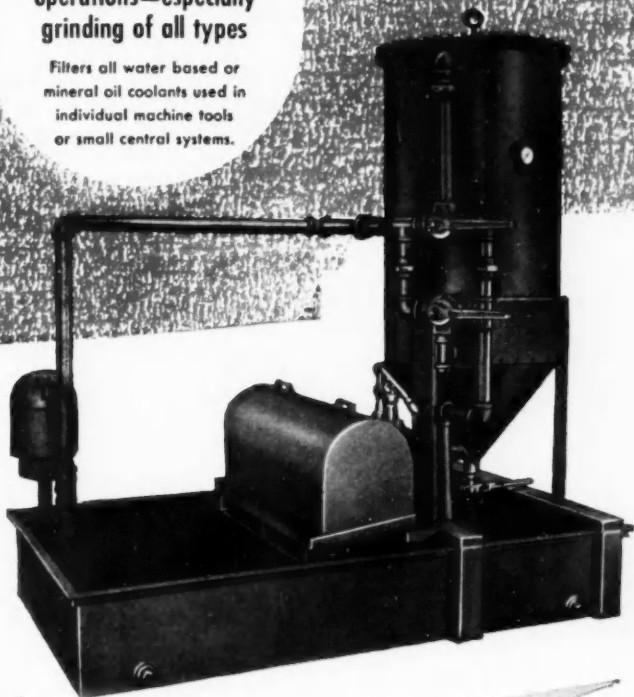
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showing cut-a-way view and  
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It's quite possible that low-temperature brazing will do a better, faster job on some of your metal joining jobs and cut costs. So you can't lose, but may gain a great deal by availing yourself of these free services.

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where water, the present standard substance, cannot be employed. Samples of three materials—benzoic acid, n-heptane, and aluminum oxide—have been used as a starter and their heat capacities determined over a useful temperature range. Such samples, in limited numbers, are being made available to laboratories having facilities for making precise measurements of heat capacity.

### Tooling Progress

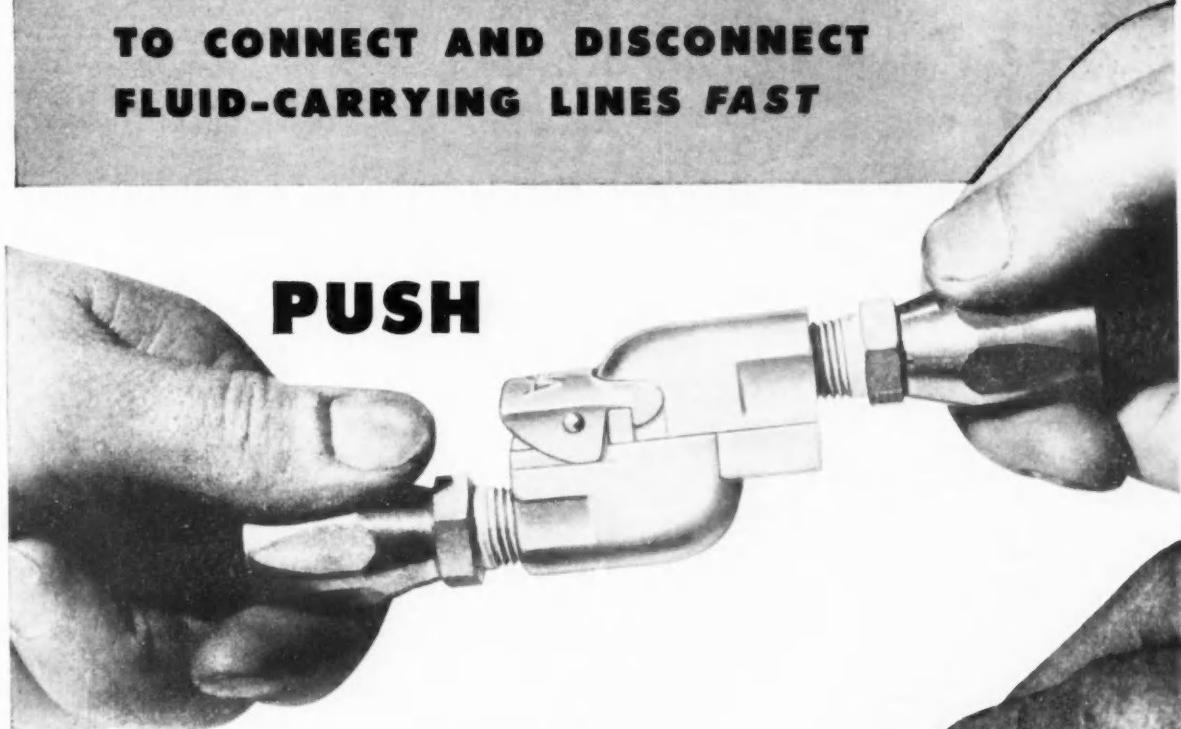
Since the appearance of Rezolin plastic dies considerable progress has been made in tailoring special die programs to meet special requirements. Allied Products Corp., for example, offers an intriguing solution for automotive manufacturers faced with a new sheet metal program. At the inception of a major sheet metal program this company is prepared to supply Rezolin dies within three or four days to permit experimental runs without loss of time. Meanwhile, it is possible to make up Kirksite dies to support an extension of the initial program beyond the life of Rezolin dies. While these dies are being used, valuable time has been gained for the making of permanent metal dies capable of carrying production for the life of the specific part. The upshot of it is that experimental production runs no longer need be delayed while waiting for the final metal dies. That is progress indeed.

### Ancient Egypt

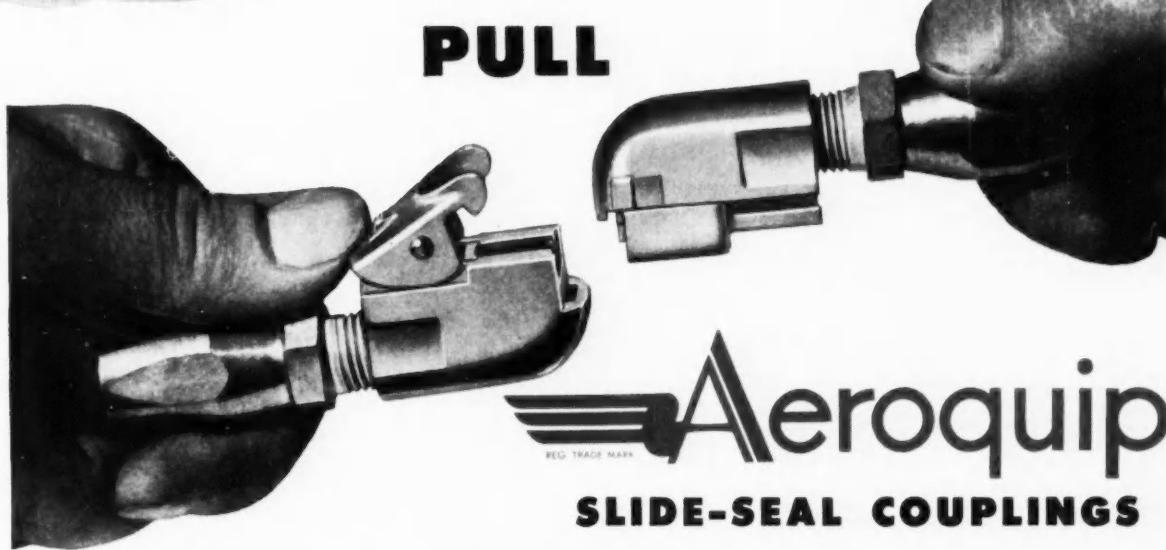
The economy of Egypt must be seen to be understood. Our recent trip there convinced us that you can't get the story from news reports. On the face of it Egypt should present an enormous market for farm tractors and agricultural machinery since practically all farming is done by methods extant 6000 years ago. However, the reforms being attempted by Naguib are designed to break up the large land holdings into small units. It is a land reform program somewhat similar to that attempted in Italy. Trouble is that when you break up farms into small units, it is no longer economical to use mechanization, particularly when manpower is so abundant. Nor can the small farmers—the peasants—afford such luxuries. Egypt could also use thousands of engine-driven pumps for irrigation were it not for the same economic limitations. Mechanization and industrialization will take generations.

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FLUID-CARRYING LINES FAST**

**PUSH**



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This Aeroquip development saves you time and money!  
**LOW COST** . . . Aeroquip Slide-Seal Couplings connect and disconnect fluid-carrying lines instantly assuring full flow of fluids when connected, and perfect seal of each half when disconnected.

**LIGHTWEIGHT AND COMPACT** . . . They are ideal for use in confined areas and may be used to advantage in a wide variety of applications.

**SIMPLE DESIGN** . . . Only four working parts and two "O" rings assure positive performance and foolproof operation.

**ADAPTABLE** for use with many fluids including hydraulic fluids, hot oil, crude and fuel oils, anti-freeze solutions, gasoline, Diesel fuels, air, water, and other fluids.

Descriptive literature is available . . . please write.

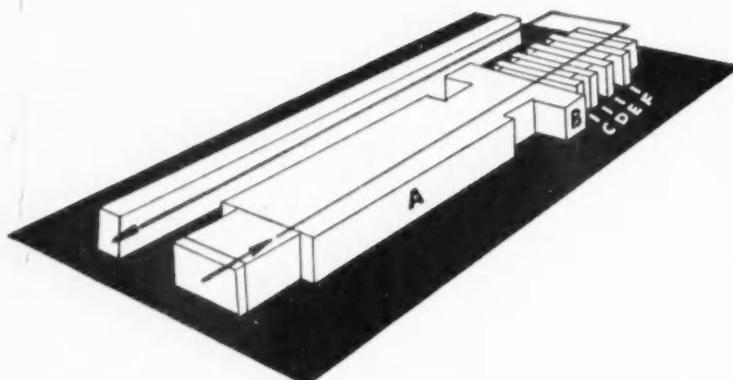
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# Heat Treat Furnace Layout

by **Holcroft**...2nd of a Series



- A** Annealing furnace
- B** Hot salt quench
- C** Wash

- D** Acid bath
- E** Wash
- F** Oil dip

## Volume Production Castings

### Annealed, Descaled, Desanded

This "U-type" furnace layout by Holcroft ties right into the production line of a large automotive plant.

The unit anneals, descales and desands 10,000 pounds of castings each hour. After annealing, the stock is dipped in a salt quench, rinsed in water, bathed in acid, water-washed again, and dipped into a soluble oil to prevent rust. A return conveyor automatically brings the trays back to the loading point.

Unusual layouts like this present no particular problem for Holcroft. After all, it's an inherent part of the job to be completely responsible for the work—from the time it is to be heat treated to the time it's ready for finishing operations. It's the type of work Holcroft does well. Holcroft & Company, 6545 Epworth, Detroit 10, Michigan.



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## SAE Summer Meeting

(Continued from page 63)

counter and the time of arrival of the spark-ignited flame front was provided as an allowance for variations in normal flame movement which might otherwise occasionally cause an unwanted recording.

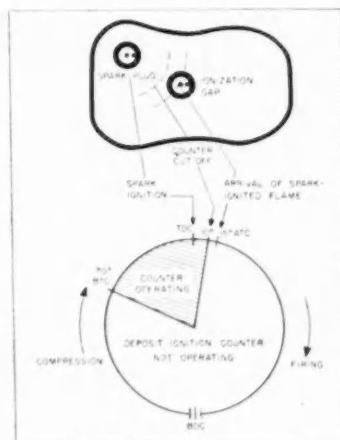


Fig. 1—Portion of engine cycle during which deposit-ignited flame fronts are recorded. Any deposit-ignited flame front arriving at ionization gap prior to 10 deg ATC (counter cutoff) is recorded by counter.

The single ionization gap cannot record late deposit ignition which causes flame fronts to arrive at the ionization gap after 10 deg ATC (counter cutoff). Furthermore, while there may be several deposit-ignited flame fronts occurring in any given engine cycle, the counter cannot record more than one. However, the system does give a representative measurement of deposit ignition during a large part of that period in the engine cycle when it can occur.

This new instrument detects early abnormal combustion due to deposits and thereby permits basic comparisons among the effects of oils, fuels, and additives. The method is superior to those previously used because it provides a continuous record and is not dependent on audible effect which does not always follow deposit ignition.

(Turn to page 130, please)

**AUTOMOTIVE INDUSTRIES  
Keeps You Informed**

ASK

# BAIRD

ABOUT IT!

## HIGH PRODUCTION TOOLING

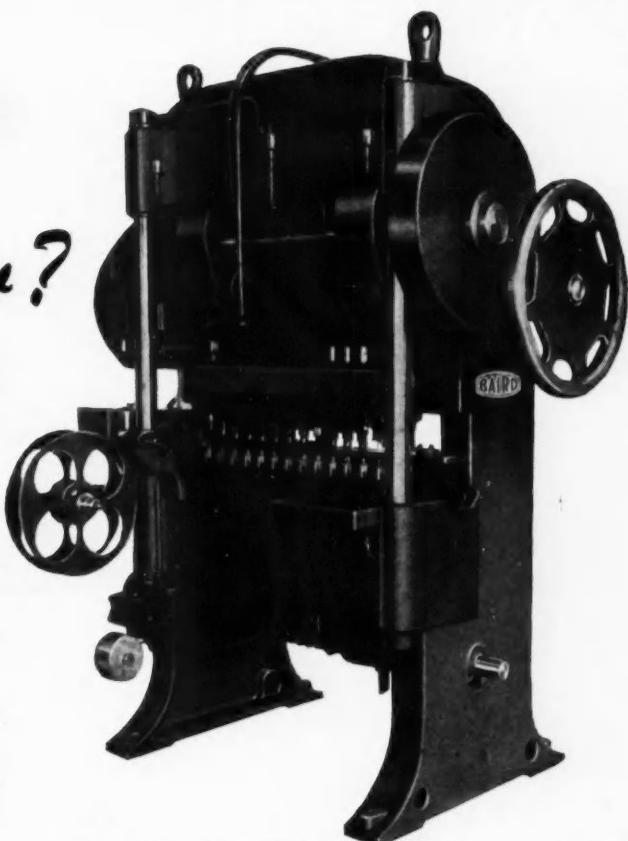
Biting off *More*  
than you can  
*Chew?*

Many types of small stamping machines can bite off coiled metal stock, but the BAIRD MULTIPLE TRANSFER PRESS cleverly chews each length into accurately formed products at the rate of thousands of pieces per hour.

Almost-human transfer fingers automatically grip and carry the work to progressive die stations where blanking, drawing, piercing, embossing, slitting, trimming, broaching, sizing, hexing, forming, etc., complete the piece.

Simply stated, the Transfer Press combines, in a single cycle, operations that otherwise might require several smaller machines with an operator for each. There are almost endless tooling possibilities . . . set-ups that turn out millions of small parts at extremely low cost.

An installation of Baird Multiple Transfer Presses puts the buyer in a most favorable competitive position in a buyer's market. Better "ask Baird about it!"



Front view of the Baird Multiple Transfer Press . . . standardized in 12 sizes with rated working pressures from 5 to 55 tons. Coiled stock from 2 1/2" to 4" in width is automatically fed at high speeds.

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# SAE Summer Meeting

## Effects of Fuels and Lubricants on Autoignition

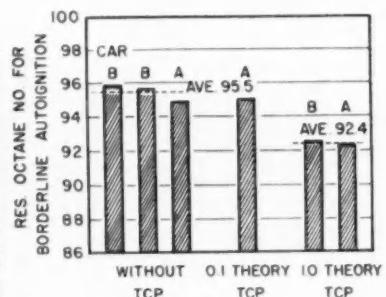
By R. K. Williams and  
J. R. Landis  
General Motors Corp.

RECENT observations of the beneficial effects of tricresyl phosphate (TCP) as a spark plug

anti-fouling agent in aircraft led to experiments to evaluate the effects of this particular phosphorus compound on autoignition in automotive-type engines. The effects of TCP were measured in a 1952 L-head engine operating at 7.7:1 compression ratio. During deposit accumulation a commercial premium gasoline and an SAE 20W paraffinic base oil were used.

Twelve measurements were used to establish autoignition tendency in each test. These tests were conducted in two cars operated with 0, 10, and 100 per cent of the theoretical amount of phosphorus required to convert all of the lead to lead orthophosphate ( $Pb_3(PO_4)_2$ ), added to the tank fuel during the deposit build-up period. Results of these tests are given in the figure. From this figure it is evident

### EFFECT OF TRICRESYL PHOSPHATE ON AUTOIGNITION TENDENCY



that 0.1 theory of TCP was ineffective in reducing autoignition tendency but that addition of 1.0 theory, a quantity much larger than normally used, reduced the requirement for borderline autoignition by approximately three octane numbers. Autoignition failures were induced by moderate to heavy knocking in the cars using 1.0 theory TCP, but no knock was noticed prior to the occurrence of autoignition in the tests using untreated fuel. Thus it would appear that retarding ignition timing when 1.0 theory TCP was used would increase the apparent benefit from this additive.

**Problem:** Run engines before installation under varying load and speed conditions—flush and fill with oil—adjust carburetion and timing—determine slippage in automatic transmission.

**Solution:** A bank of Nankervis Test Stands. These stands provide automatic control of the engine throughout the entire test pattern. If engine does not attain pre-set standards, reject is automatic, and pilot lights indicate nature of failure. One operator handles four test stands simultaneously.

#### CHECK THESE IMPORTANT FEATURES:

- All welded steel construction
- Fully automatic—electronically controlled
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- Only dependable components used—all accessible
- Automatic shut-off for "reject" engines
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Nankervis designs and builds all types of equipment for testing complete engines, hydraulic components, electrical accessories and similar electro-mechanical and hydraulic devices. Write today for bulletin No. 61.

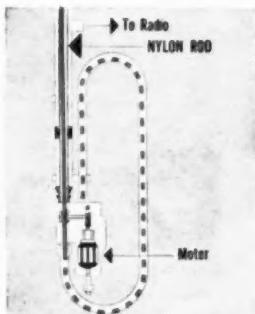
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INDUSTRIAL TESTING DEVICES  
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# How mechanical parts of **DU PONT NYLON** give improved performance

**Automatic antenna** has a flexible rod of Du Pont nylon that raises and lowers the "live" members. Nylon was the only material flexible enough to fold into the trombone-like position, yet rigid enough to force the antenna up and down.



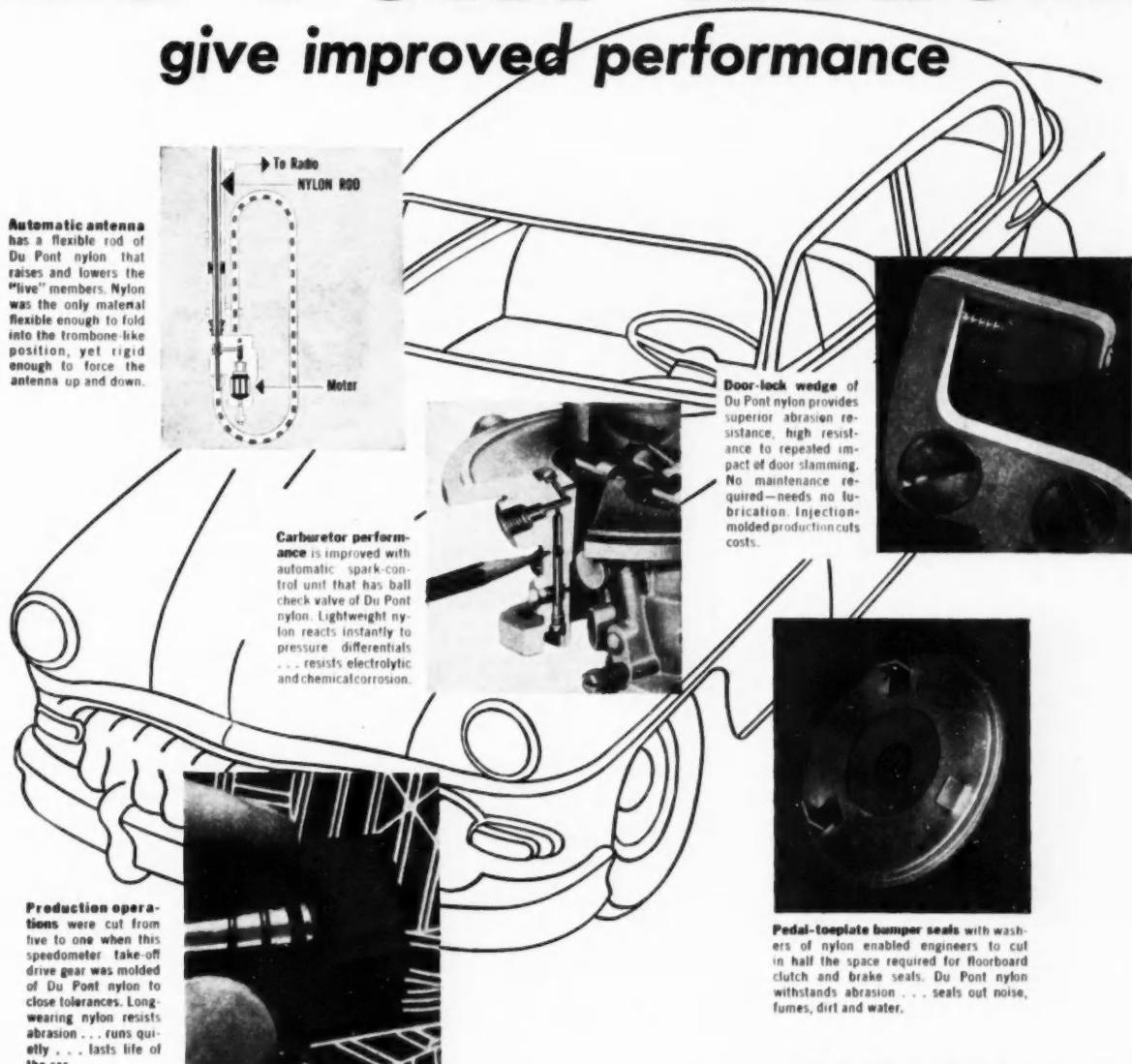
**Carburetor performance** is improved with automatic spark-control unit that has ball check valve of Du Pont nylon. Lightweight nylon reacts instantly to pressure differentials . . . resists electrolytic and chemical corrosion.



**Door-lock wedge** of Du Pont nylon provides superior abrasion resistance, high resistance to repeated impact of door slamming. No maintenance required—needs no lubrication. Injection-molded production cuts costs.



**Production operations** were cut from five to one when this speedometer take-off drive gear was molded of Du Pont nylon to close tolerances. Long-wearing nylon resists abrasion . . . runs quietly . . . lasts life of the car.

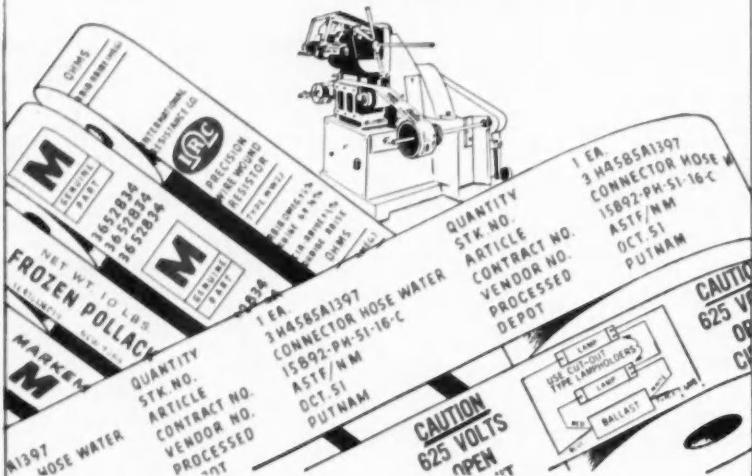


Illustrated here are five examples of how Du Pont nylon plastic is improving performance and reducing costs of automotive parts. Forward-looking engineers are blueprinting many of their new ideas through Du Pont nylon's unique combination of mechanical and electrical properties.

Perhaps nylon's proven properties can help you engineer your present problem or future idea. For full information, write: E. I. du Pont de Nemours & Co. (Inc.), Polychemicals Dept., Room 177 Du Pont Bldg., Wilmington 98, Del.

Pedal-toeplate bumper seals with washers of nylon enabled engineers to cut in half the space required for floorboard clutch and brake seals. Du Pont nylon withstands abrasion . . . seals out noise, fumes, dirt and water.



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ON PRESSURE SENSITIVE TAPE**

The introduction of pressure sensitive tape for industrial uses offered many advantages if label data could be printed on the tape in the plant itself when needed. Markem developed methods that permit printing of stock number, part number, trade mark or other designation on this tape. Label inventory problems are thus eliminated. Manufacturers can now print the exact number of labels required . . . readily changing variable information or color of ink when desired. The Markem method used includes a Markem machine which makes up to 85 imprints per minute, rewinds the roll of tape automatically, and shuts itself off after a selected number of imprints. Thus Markem has provided industries of all types with a more modern, more attractive and less expensive means of labeling.

**MARKE M****MARKS THEM ALL**

**CAN MARKE M** Printing labels on pressure sensitive tape is but an example of how Markem solves industry's marking problems. Markem has been providing industry with production techniques and equipment to identify, decorate or designate its products, parts and packages since 1911. Markem also provides technically trained men who are available in your area to assure continued satisfaction with Markem methods and equipment.

When you have a marking problem, tell us about it and send a sample of the item to be marked. Perhaps a complete Markem method has already been developed to solve your problem. If not, Markem will work out a practical solution.

Markem Machine Company, Keene 6, N. H., U. S. A.



shown to be very effective in reducing the tendency to preignition arising from spark plugs. This was determined in a water-cooled engine and has not, to the author's knowledge, been confirmed in aircraft engines.

**Causes**

**d. SPARK PLUGS**—Plugs which are too hot for the engine condition of operation are a major cause. Cracked or broken ceramic insulators in plugs which are suitable when undamaged, have been a potent source of trouble.

**e. ADDITIVE OILS**—Additive oils of detergent type can, if the additive is unsuitable, produce very serious difficulties. In aircraft engines, very dirty pistons will often go for long service periods without ring sticking. Pistons with silvery white skirts and ring belts may have a short and gay life, ending in a molten condition.

**f. EXHAUST VALVES**—Exhaust valves, at least in high power aircraft engines, do not appear to be a present cause of preignition. With current practice, valve crown corrosion is still encountered but the corrosion products do not appear to cause preignition.

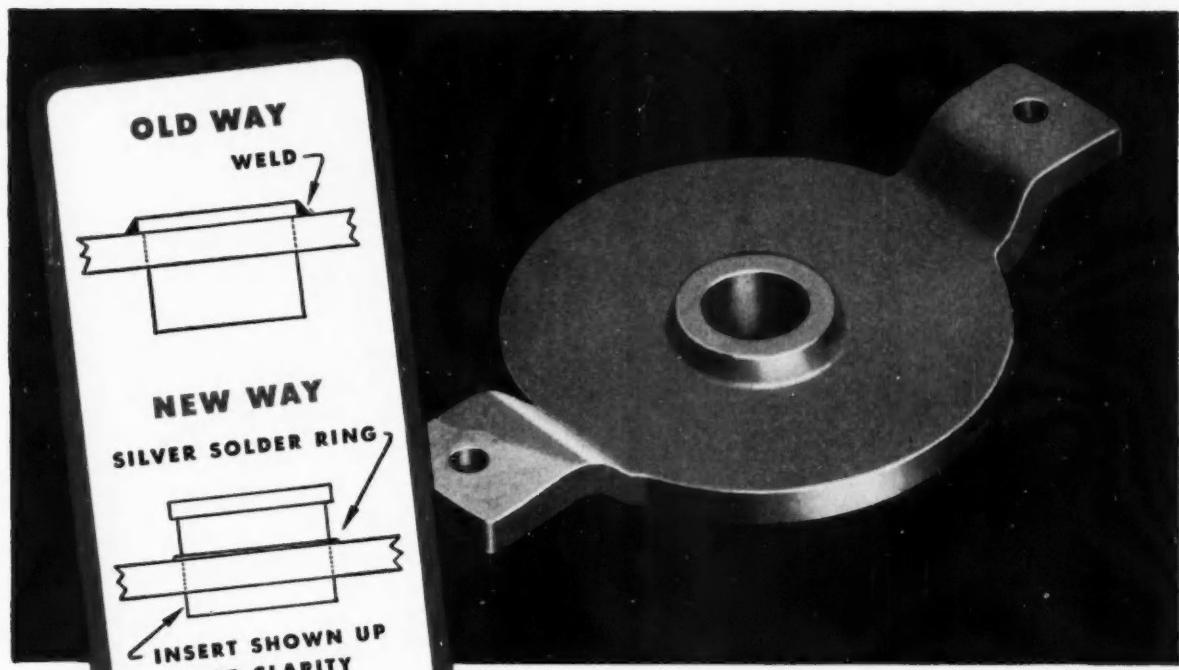
Sodium cooling alone will not prevent deposits on the crown which can cause preignition. Such deposits do occur with unsuitable valve materials and valves with sodium in the stem only but are not known (at least to the author) where a hollow head is used.

**Effects**

The effects of preignition are in the main due to excessive temperatures of the cylinder unit. Effects on the induction system may, however, be either thermal or mechanical. Catastrophic increases of cylinder temperature are a very usual result of preignition at high power output levels. Lacking other means, these temperature effects can usually be detected early enough to avoid damage if a spark plug thermocouple gasket is used and closely observed.

**g. PISTON**—The piston is usually the major item of damage. Blowing holes in the crown or ring belt, burning, melting or seizure are usual effects. The aircooled engine is more prone to seizure than is the water-cooled type. Burning may not lead to either seizure or melting and usually starts with pitting which progresses until the surface resembles that of a piece of foundry or blast furnace coke.

**b. CYLINDER HEADS**—Cracking



## Assembly Cost Cut 32% with TOCCO\* Induction Brazing



**Now's the time to balance YOUR production budget**

This assembly may bear no resemblance to your product, but its case is typical of the savings accomplished by Induction Heating of metal parts of all sizes and shapes.

Formerly the Norris Thermador Corpora-

tion used arc welding to join the bushing and clamp shown above. In an effort to reduce costs TOCCO Induction Heating was brought into the production picture with the following results:

### OLD METHOD (Arc Welding)

Material (rod) . . . . .	\$ 4.56 per M parts
Labor. . . . .	20.63 per M parts
Overhead . . . . .	21.25 per M parts
Total Cost Old Method . . .	\$46.44 per M parts

### NEW METHOD (TOCCO Induction Brazeing)

Material (solder and flux) . .	\$13.83 per M parts
Labor. . . . .	8.82 per M parts
Overhead . . . . .	9.08 per M parts
Total Cost TOCCO Method .	\$31.73 per M parts

TOCCO Engineers are glad to survey your operations for similar cost-cutting results—no obligation, of course.

**THE OHIO CRANKSHAFT COMPANY**



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Please send copy of "Typical Results of TOCCO Induction Brazeing and Soldering."

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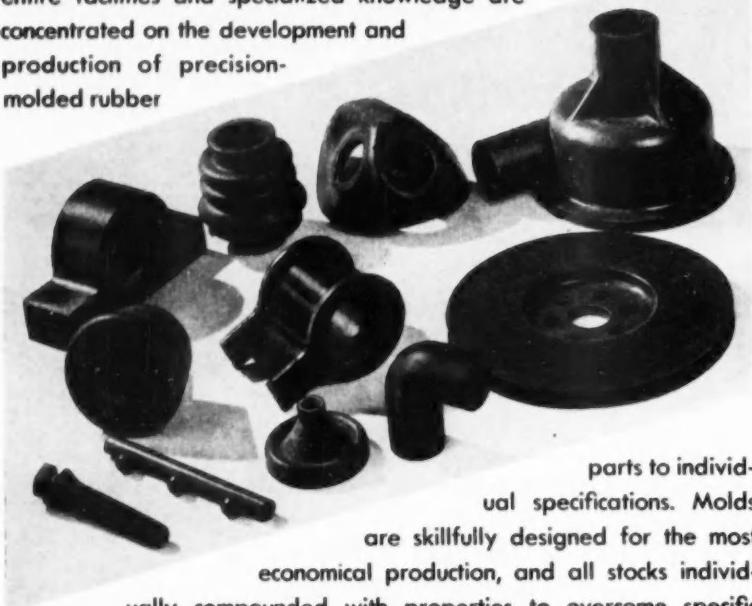
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of both aircooled and water-cooled cylinder heads is a common product of preignition.

j. VALVES—Stretching of exhaust valves is a common result and not unknown in intake valves. Burning and warping of exhaust valves is often found.

k. SPARK PLUGS—Spark plug damage is extremely likely. Some types of aviation plugs will stand repeated mild preignition (the author knows of one aviation plug which stood about 1000 mild attacks of preignition without changing its heat rating). In general, it is quite a trick to rate a spark plug for preignition without damage. Avoidance of damage is desirable in order to be able to obtain check ratings.

l. INDUCTION SYSTEM—Preignition may or may not cause induction system damage. The damage may be either thermal or mechanical. In a supercharged engine having a carburetor and operating at high manifold pressure (30 lb gage, for example), preignition may produce backfires which may cause parts of the induction system to depart for points unknown. In a similar engine fitted with cylinder head fuel injection, backfires are unlikely to produce induction system damage. Induction system fires can result from backfires in carbureted engines. In aircraft engines, cases have occurred where the fire remained stationary in the supercharger voltage. This, apparently, was due to the gas velocity equaling the rate of flame propagation.

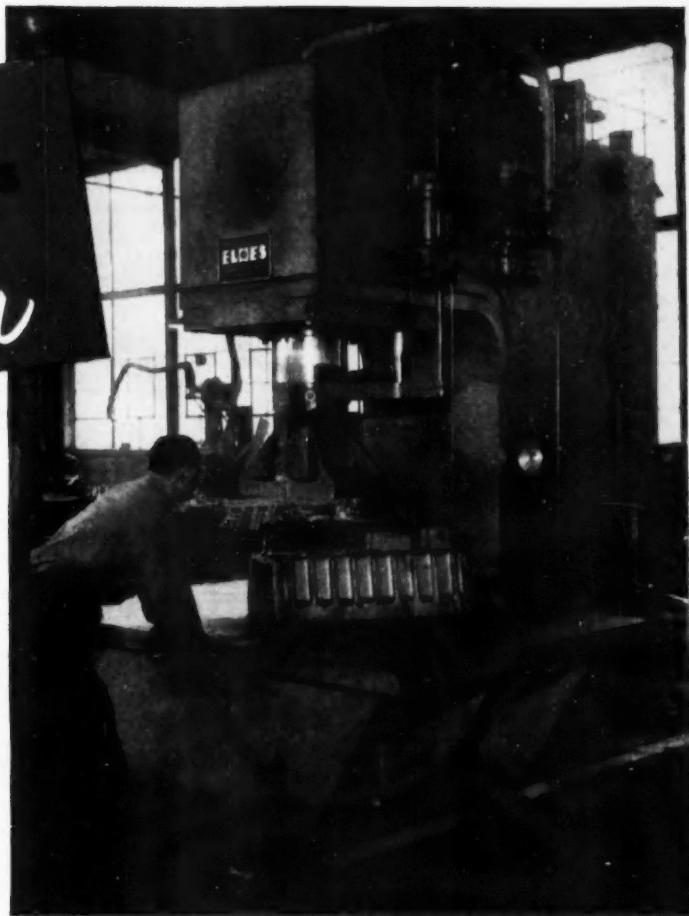
## Investigating Preignition

By A. O. Melby, D. R. Diggs  
and B. M. Sturgis  
E. I. du Pont de Nemours & Co., Inc.

To determine the effectiveness of particles as sources of preignition in automobiles, four different makes of recent model passenger cars were equipped with apparatus which permitted the introduction of particles into one cylinder during road operation. The induction system of the car was modified so that a small quantity of powdered deposit could be inducted just ahead of the intake valve at the beginning of full-throttle acceleration to a road speed of 55 mph. During this acceleration, any preignition that occurred was detected by ear. The combustion chambers of the cars were cleaned thoroughly prior to the road tests, and the spark ignition timing was adjusted to the manufacturer's specifi-

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*Elmes Open-Side Press in plant of Maynard Electric Steel Casting Company, Milwaukee, producers of electric furnace steel castings.*

The Elmes 250-Ton Hydraulic Open-Side Press shown in photograph is used for straightening castings ranging from 50 to 4000 lbs. The Maynard Electric Steel Casting Company reports that this Elmes Press is 40% speedier than the presses previously used, and also is more accessible and more economical to operate.

This is but one of many types of hydraulic metal-working presses produced by Elmes—but the customer report is typical in its praise of Elmes' craftsmanship in press design and manufacture.

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*Write for information regarding the following types of Elmes equipment for use in automotive, aviation and defense production: Drawing and Forming Presses . . . Tube Bending Presses . . . Special Tube Reducing Presses . . . Straightening Presses . . . Forging Presses . . . Forging Presses . . . Steel Extrusion Presses . . . Descaling Equipment.*

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cations. Primary reference fuel blends having antiknock qualities slightly greater than necessary for the suppression of knock were used as test fuels. Neither knock nor preignition was observed at any time when deposit particles were not introduced. Effects resulting from the introduction of 1.0 gram of 0.006-0.012 in. particles are summarized in the table below.

Engine noises resulting from the introduction of both leaded fuel deposit particles and carbon-lead oxide particles were essentially the same as

the wild ping-type of preignition noise which often occurs during road accelerations. These observations suggest, therefore, that detached deposit particles may be one cause of wild ping in cars on the road.

#### PREIGNITION FROM PARTICLE INTRODUCTION DURING ROAD ACCELERATION

Particles	Estimated Number of Preignitions	Type of Noise
Leaded Fuel Deposits	6	Moderately Sharp Cracks
Unleaded Fuel Deposits	2	Dull Thuds
Sugar Carbon + PbO	21	Sharp, Violent Cracks
Sugar Carbon + PbCl <sub>2</sub>	2	Dull Thuds
Sugar Carbon	1	Dull Thuds

## Torque Converters for Tractor-Trailers

By P. L. Gillan and  
W. S. Coleman  
The White Motor Co.

SEVERAL companies, including the White Motor Co., have been exploring the performance of converters in conjunction with five-speed transmissions in heavy duty, long distance tractor-trailer operation. Our own work was done with a 60,000 lb gross combination tractor and tandem semi-trailer. The tractor was equipped with a 504 cu in. gasoline engine, Spicer two-stage torque converter with 3 to 1 stall torque ratio, and a five-speed synchronized transmission. The transmission ratios were 1.00, 1.33, 1.78, 3.05, and 5.08. The axle ratio was 6.29. The converter included a direct lock up controlled by a governor set to give a lock up condition above 2400 rpm and return to converter drive below 1500 rpm. A 14 in. single plate clutch between the converter and transmission was used to interrupt the drive line for manually shifting the synchronized transmission.

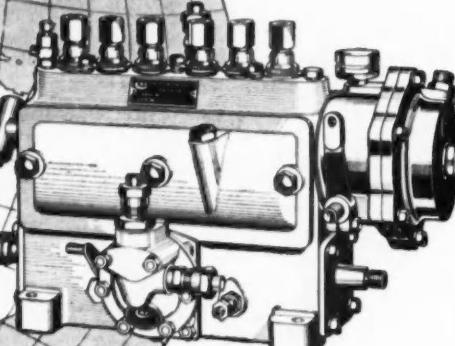
The installation was so arranged that test trips could be run alternately with and without the aid of the torque converter. With the converter locked out, the best acceleration was possible going progressively up through the five transmission speeds. When the converter was in use, the acceleration was best when starting in second gear. It was almost as good when starting in third gear. Comparative acceleration curves of the straight mechanical against the combination of converter and four speeds as obtained in actual tests again show the converter combination has good initial acceleration.

A series of 200-mile tests was run alternately with and without the use of the converter. The test route was over rolling country and through numerous small towns, but with approximately 10 miles of heavy city traffic at each end of the trip. During the tests, by using the converter in conjunction with third gear of the transmission, it was possible to operate in city traffic without making any gear shifts.

Data from these tests were compared with those obtained by two other companies in similar tests of converter transmissions against straight mechanical transmissions,



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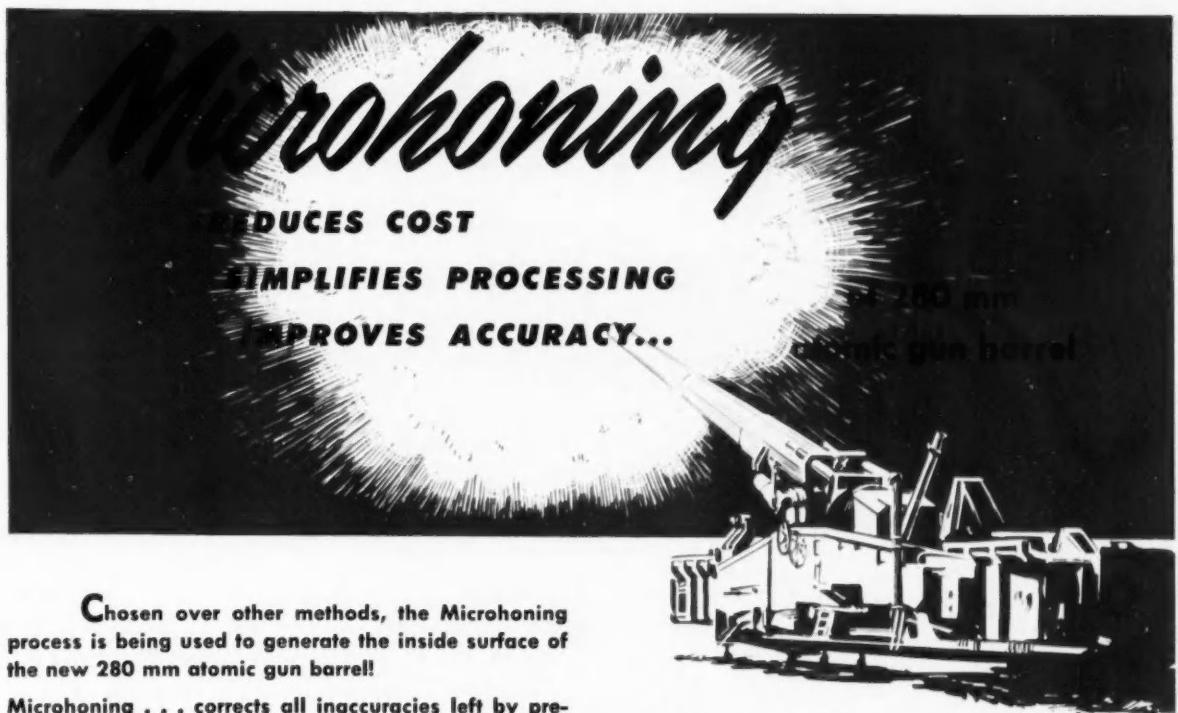
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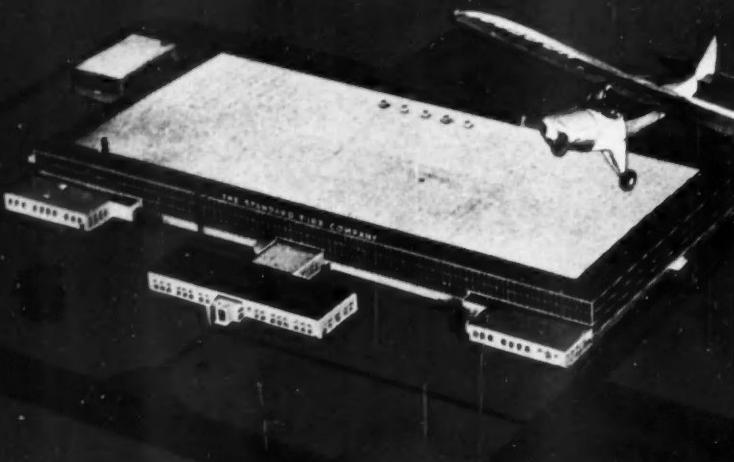
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and the following observations were made:

1. On the converter units the average number of gear shifts per mile ran from 45 per cent to 65 per cent of the number of shifts on the geared units.

2. There was a maximum variation of three per cent in average speed on each series of tests. In some cases the converter unit excelled, and in other cases, the geared unit was faster.

3. The fuel consumption varied a maximum of seven per cent with the converter proving superior in several of the runs.

4. Average engine revolutions per mile were consistently less on the converter units, the maximum difference being 12 per cent.

## New Products

For additional information please use postage-free reply card on page 89

(Continued from page 88)

### Headlamp

Recently introduced is a sealed-beam headlamp for use on automobiles with 12-volt electrical systems, designated No. 4400. The headlamp is similar in size and appearance to the all-glass, sealed-beam headlamps in general use, and is said to give comparable lighting performance. General Electric Co.

Circle P-9 on page 89 for more data

### Alternate Steel

Recently developed is an austenitic alternate for 18-8 stainless steel which is said to offer good cold working properties, weldability, and ductility. It's produced with manganese, chromium, and less than one per cent nickel as principle alloying elements. Allegheny Ludlum Steel Corp.

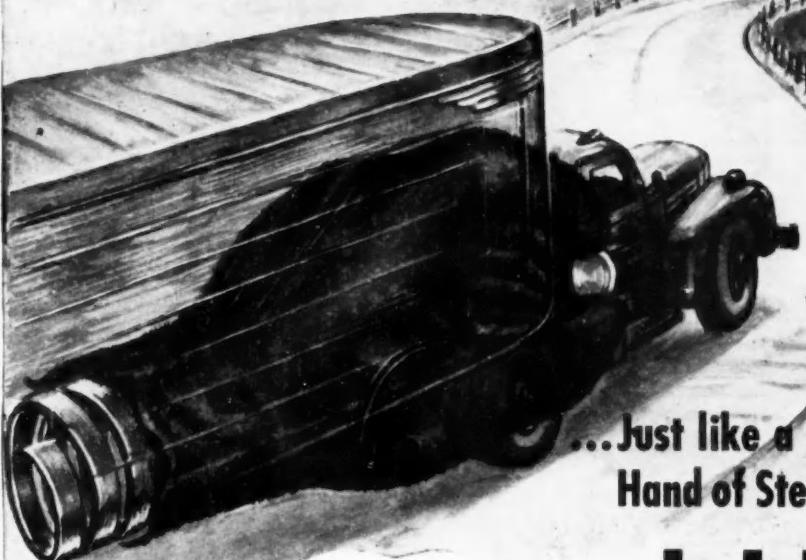
Circle P-10 on page 89 for more data

### Special Fasteners

Recently announced is a new line of push-on type Speed Nuts with immediate availability in most sizes. This C12000 Series is said to provide a positive bite that holds integral studs, rivets, tubing and other unthreaded parts in vibration-proof attachment. Tinnerman Products, Inc.

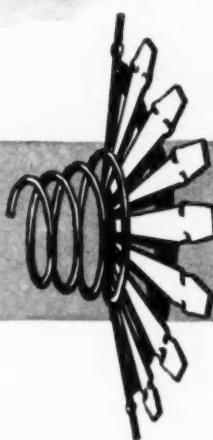
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**TABLE I**  
**Tensile Properties and Grain Sizes of AZ92A-T6 Cast in Shell Molds, Green Sand Molds, and Permanent Molds\***

Casting Method	No. of Tests	%** E	Y.S. 1000 psi	T.S. 1000 psi	Average Grain Diameter, 0.001 in.
Shell Mold	10	1	25.2	39.2	2
Green Sand	10	1	23.6	33.1	4
Permanent Mold	10	1	22.3	36.7	10

\* Specimens Machined from Castings.

\*\* Per cent elongation in 2 in.

## SHELL MOLD DEVELOPMENTS

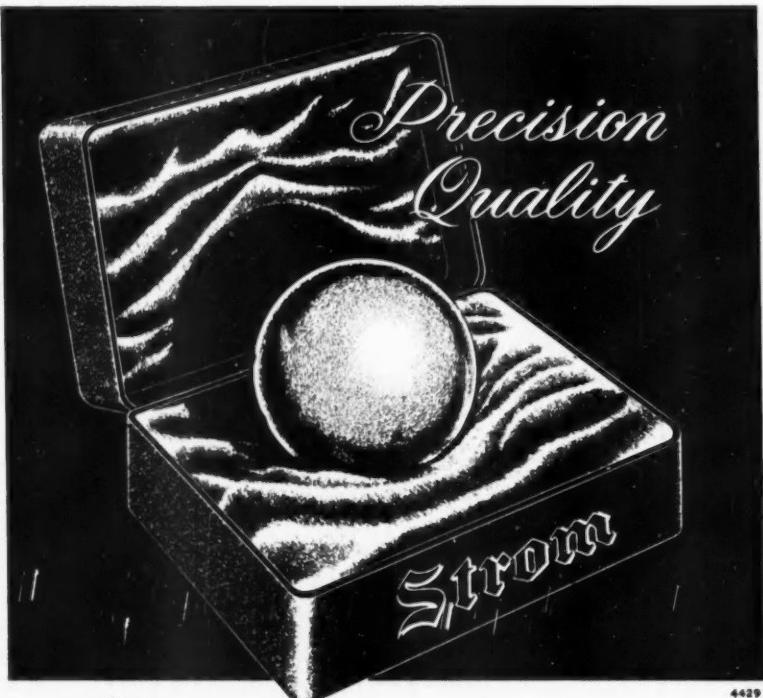
(Continued from page 111)

castings had a higher ultimate tensile strength than the green sand castings and the permanent mold castings. The yield strength for the shell mold castings was also higher. The elongation for all castings was one per cent. The average grain size for the shell mold castings was 0.002 in. compared to 0.004 in. for the green sand and

0.010 in. for the permanent mold castings.

Radiographs of the bars tested revealed some porosity in the permanent mold bars.

*The foregoing are abstracts of papers presented at the 57th Annual Meeting of the American Foundrymen's Society held in Chicago last month.*



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## CALENDAR OF COMING SHOWS AND MEETINGS

- 20th International Aeronautical Meeting, Le Bourget Field, Paris, France .....June 26-July 5
- American Society for Testing Materials, Chalfonte-Haddon Hall, Atlantic City, N. J. ....June 29-July 3
- Sixth Annual International Aviation Exposition, Detroit, Mich. ....July 9-12
- SAE International West Coast Meeting, Georgia Hotel, Vancouver, B. C. ....Aug. 17-19
- Western Electronic Show & Convention, Civic Auditorium, San Francisco, Calif. ....Aug. 19-21
- National Aircraft Show and 50th Anniversary of Powered Flight, Vandalia Airport, Dayton, O. ....Sept. 5-7
- Society of British Aircraft Constructors' Display, Farnborough .....Sept. 7-13
- SAE National Tractor Meeting and Production Forum, Hotel Schroeder, Milwaukee, Wis. ....Sept. 14-17
- Eighth National Instrument Conference and Exhibit, Chicago, Ill. ....Sept. 21-25
- SAE Aeronautic Meeting, Hotel Statler, Los Angeles, Calif. ....Sept. 29-Oct. 3
- Paris Salon, France .....Oct. 1-11
- 38th International Motor Show, Earls Court, London .....Oct. 21-31
- SAE International Production Meeting, Royal York Hotel, Toronto, Canada .....Oct. 29-30
- American Society of Tool Engineers, semi-annual membership and board meeting, Dayton Biltmore Hotel, Dayton, O. ....Oct. 30-31
- SAE National Transportation Meeting, Conrad Hilton Hotel, Chicago, Ill. ....Nov. 2-4
- SAE National Diesel Engine Meeting, Conrad Hilton Hotel, Chicago, Ill. ....Nov. 3-4
- SAE National Fuels and Lubricants Meeting, Conrad Hilton Hotel Chicago, Ill. ....Nov. 4-6
- Montreal Materials Handling, Tool and Industrial Equipment Shows, Show Mart, Montreal, Que. ....Nov. 9-13
- 1954
- SAE Annual Meeting, Sheraton-Cadillac Hotel and Hotel Statler, Detroit, Mich. ....Jan. 11-15
- National Motor Boat Show, Bronx, N. Y. ....Jan. 15-23
- National Transport Vehicle Show and Fleet Maintenance Exposition, New York, N. Y. ....Feb. 17-19
- SAE National Passenger Car, Body, and Materials Meeting, Hotel Statler, Detroit, Mich. ....March 2-4

## SHORTIES

The average modern automobile is composed of approximately 15,000 different pieces, as compared with a typical high performance jet fighter, which contains an estimated 165,000 separate machined parts.

The refining phase of the oil industry set a new operating record in 1952. Refinery runs averaged 6,670 million barrels daily during the year.

Every gallon of modern gasoline contains from 3500 to 5000 chemical compounds made up of hydrogen and carbon.

A mammoth military air transport, now in service, can carry 200 soldiers with equipment.

A jet medium bomber has 220 miles of wire and 1000 vacuum tubes in its electronic system.

It takes about four years for the military service to spend aircraft procurement funds appropriated by Congress.

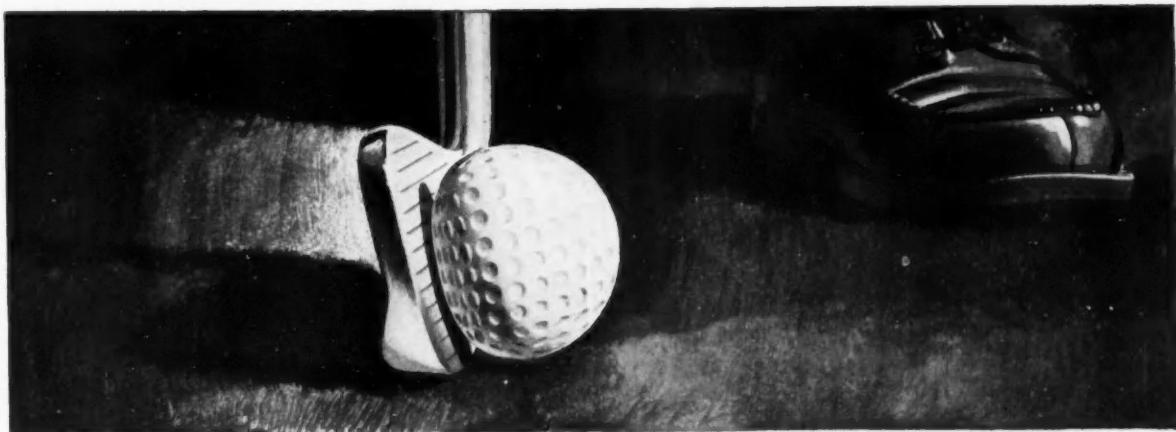
A typical modern fighter plane requires 27 times as many engineering hours as its World War II counterpart.

In the same average eight-cyl engine, the valves will travel approximately one-quarter of a mile in their guides for every mile of automobile travel on the road.

The total oil energy used in farming is about 750 million hp.

It is estimated that 65 million automobiles will jam U. S. highways by 1975.

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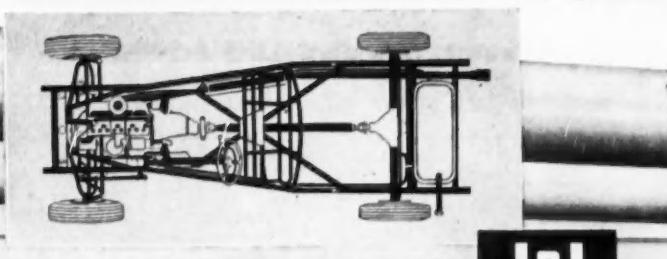
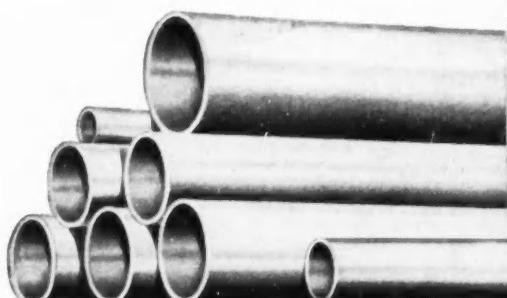
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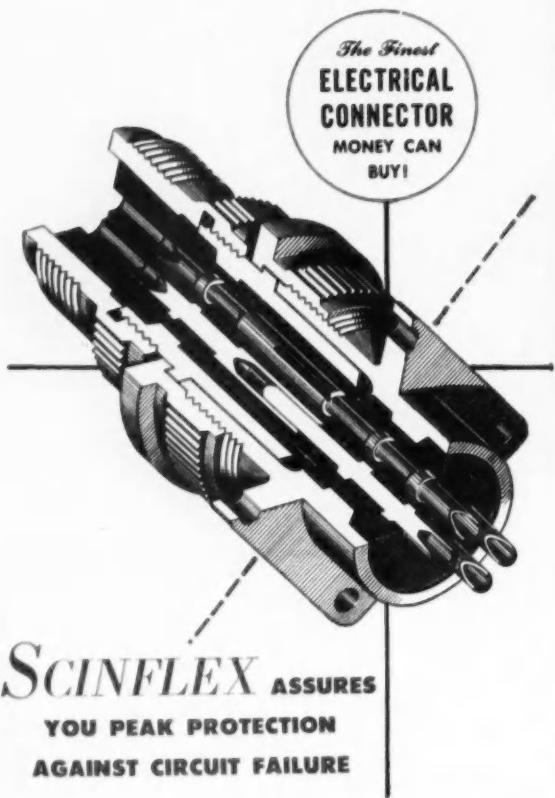
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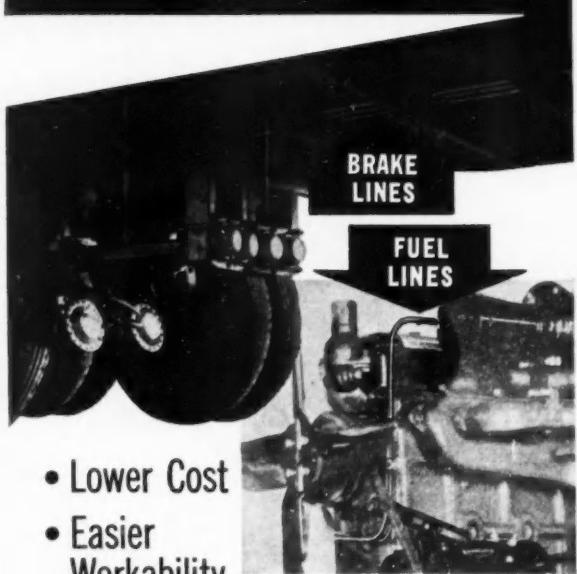
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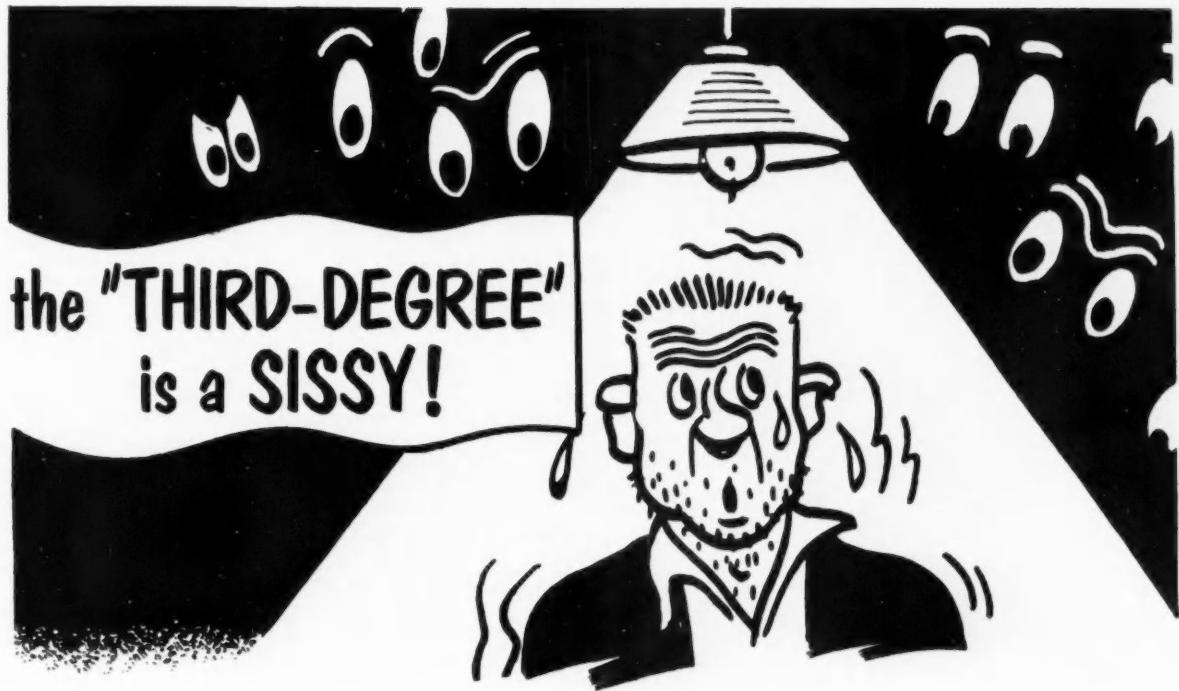
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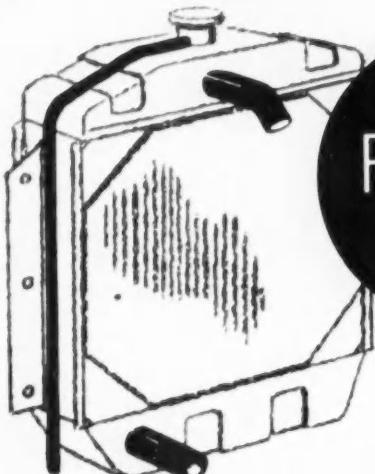
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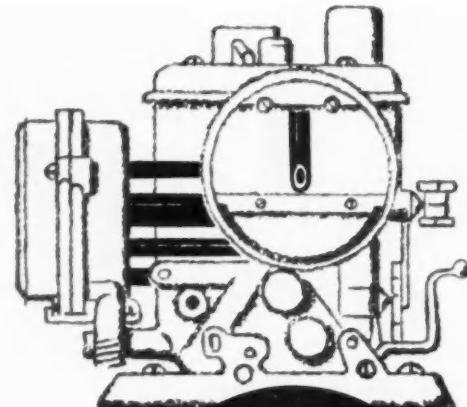
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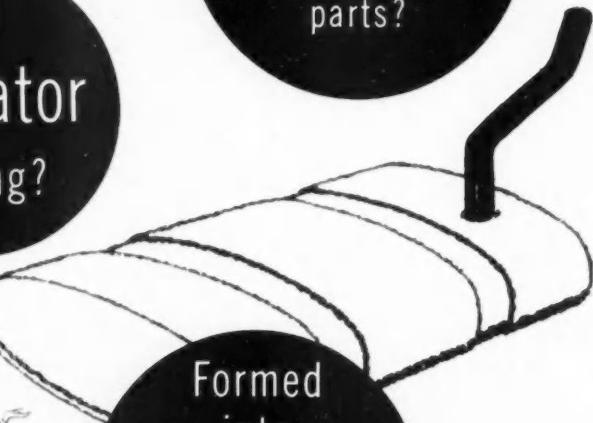


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Available for  
Fabrication and redraw in Ranges  
of  $\frac{1}{8}$ " O.D. to and including  $1\frac{1}{2}$ " O.D.;  
wall thickness range, .010 to and including .065.  
70/30, 80/20 and 85/15 alloys available



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LOCKSEAM



COIL STRIP



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SEAMLESS TUBING



TUBULAR PARTS

# What were YOUR sales for '52 in Adams County?



Did you get  
**YOUR SHARE**  
of the market?

CHECK the facts  
against total car and  
truck registrations

## POLK MARKET VALUATION INDEX

R. L. Polk & Co., for years compilers of the official car registrations, now make this basic sales information available on special work sheets set up market by market, county by county, city by city, with column headings under which you can post your own sales figures, expenditures, and quotas. Compare instantly your performance figures against actual car and truck registrations. Write, wire or phone for complete information.

TOTAL CAR AND TRUCK REGISTRATIONS		PERCENT OF TOTAL		ENTER YOUR OWN SALES INFORMATION IN THESE COLUMNS																																																																																																																									
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USE THIS COMPREHENSIVE NEW MARKET ANALYSIS

**R. L. POLK & CO.**  
MOTOR STATISTICAL DIVISION  
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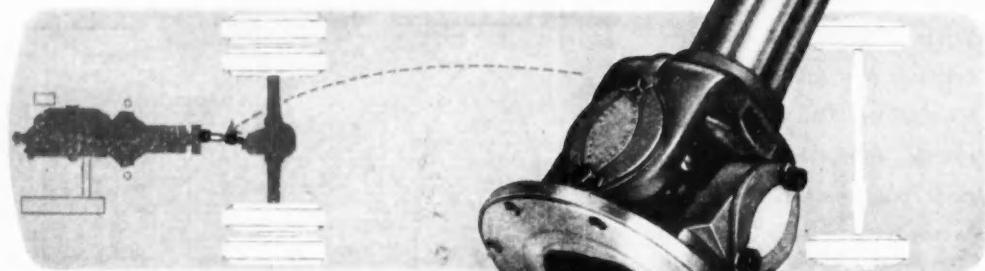
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*Finishing*

# SYSTEMS

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... the EXPERIENCE that goes  
into the PLANNING and ENGINEERING  
of MAHON EQUIPMENT is the Item of  
GREATEST VALUE to YOU!

Exit end of Mahon Two-Conveyor-Line Metal Cleaning and Rust Proofing Machine at American-Standard, Buffalo, N. Y.

Entrance end of Mahon Metal Cleaning and Rust Proofing Machine with two parallel conveyor lines. Note combined Dry-Off and Finish Baking Oven overhead at right.

## American-Standard Products Receive Their Fine Finish in Mahon Equipment!

Illustrated here are major elements of one of two Complete Finishing Systems recently installed by Mahon in the Buffalo Stamping Plant of American-Standard. In this particular system, which is ultramodern in every respect, jackets and other metal parts of residential heating and cooling units are carried through the entire system on two parallel conveyor lines. Metal Cleaning and Rust Proofing is accomplished on the two conveyor lines in a single processing tunnel. The two parallel conveyor lines then carry parts through an overhead bottom entrance, single-pass Dry-Off Oven which is an integral part of the Finish Baking Oven. Parts on each of the conveyor lines then pass through two conventional type Hydro-Filter Spray Booths, staggered right and left hand, where the finish is applied. Finish is baked while the two parallel conveyors make a double pass circuit in the finish baking section of the overhead oven. This is a typical Mahon engineered Finishing System. If you are contemplating new finishing equipment, you too, will find that Mahon engineers are better qualified to do the all-important planning and engineering which is the key to fine finishes at minimum cost . . . and you will also find Mahon equipment more economical to operate over a longer period of time. See Mahon's Insert in Sweet's Plant Engineering File for further information, or write for Catalog A-653.

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HOME OFFICE and PLANT, Detroit 34, Mich. • WESTERN SALES DIVISION, Chicago 4, Ill.

Engineers and Manufacturers of Complete Finishing Systems—including Metal Cleaning and Pickling Equipment, Metal Cleaning and Rust Proofing Equipment, Hydro-Filter Spray Booths, Filtered Air Supply Systems, and Drying and Baking Ovens; Core Ovens, Heat Treating and Quenching Equipment for Aluminum and Magnesium, and other units of Special Production Equipment.

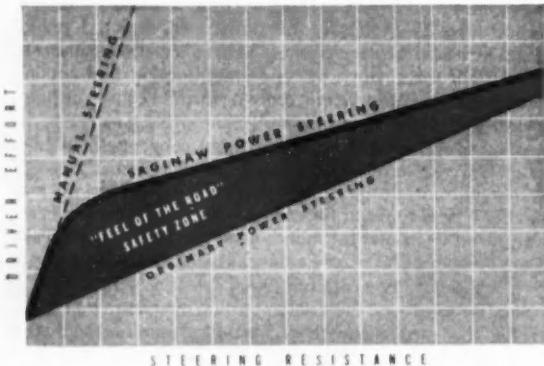
# MAHON



Number Two of a Series

## What every Automobile man should know about **Power Steering**

POWER STEERING is attracting more attention in the automotive field, and winning more rapid public acceptance, than anything since automatic transmission. Saginaw Power Steering is now available on all General Motors cars and three other well-known makes. Already over half a million new car owners are enjoying it—yet, as with any new product, there are still some misconceptions due to incomplete or faulty information. That's why we, as the world's largest producer of power and manual steering gears, are publishing this series of messages to help answer some of the questions most frequently asked about Power Steering.



This simplified graph shows the basic difference between Saginaw Power Steering and ordinary types. The latter apply power at the slightest touch of the wheel, tending to cause over-control. Saginaw Power Steering goes into action only when more than "fingertip" pull is needed. This SAFETY ZONE is purposely provided to assure normal "feel of the road" and prevent over-steering.

**4. WHY IS "FEEL OF THE ROAD" SO IMPORTANT TO POWER STEERING SAFETY?** Without this familiar "feel" in the steering wheel, many drivers have a sense of insecurity and a tendency to over-steer. In other words, *when power is applied continuously, steering is frequently too easy for safety*. So we have deliberately designed Saginaw Power Steering to go to work *only when you need it*. Whenever mere "fingertip" effort is needed to steer (as at high speeds on a smooth, straight highway) your car remains under conventional manual control. But, the moment *more* than "fingertip" effort is called for, Saginaw Power Steering instantly supplies the additional "muscle"—with just enough effort left to the driver to assure the normal "feel of the road"—as graphically shown in the chart. With Saginaw Power Steering there is never any sensation of "driving on ice." *It never interferes with safe control of your car.*

**5. MUST DRIVERS BECOME ACCUSTOMED TO POWER STEERING?** Not Saginaw Power Steering! There's nothing new to learn because your wheel still has that reassuring "feel of the road" at all times. *You cannot feel Saginaw Power Steering "cut in" or "cut out".* The only difference you notice is the effortless ease of turning...the wonderful freedom from "wheel fight." After a turn, your car straightens out exactly as with manual steering.

The simple, ingenious Saginaw design which accomplishes all this so dependably will be the subject of our next message. **MEANWHILE**—if you'd like to learn more, we'll be delighted to send you "**THE FACTS ABOUT POWER STEERING**"—an interesting booklet we've prepared to help give you a better understanding of this important new development. It's yours for the asking—just use the handy coupon.

# Saginaw

**POWER STEERING**

Saginaw Steering Gear Division  
General Motors Corporation  
Saginaw, Michigan (Dept. I)

Please send a free copy of "The Facts About Power Steering."

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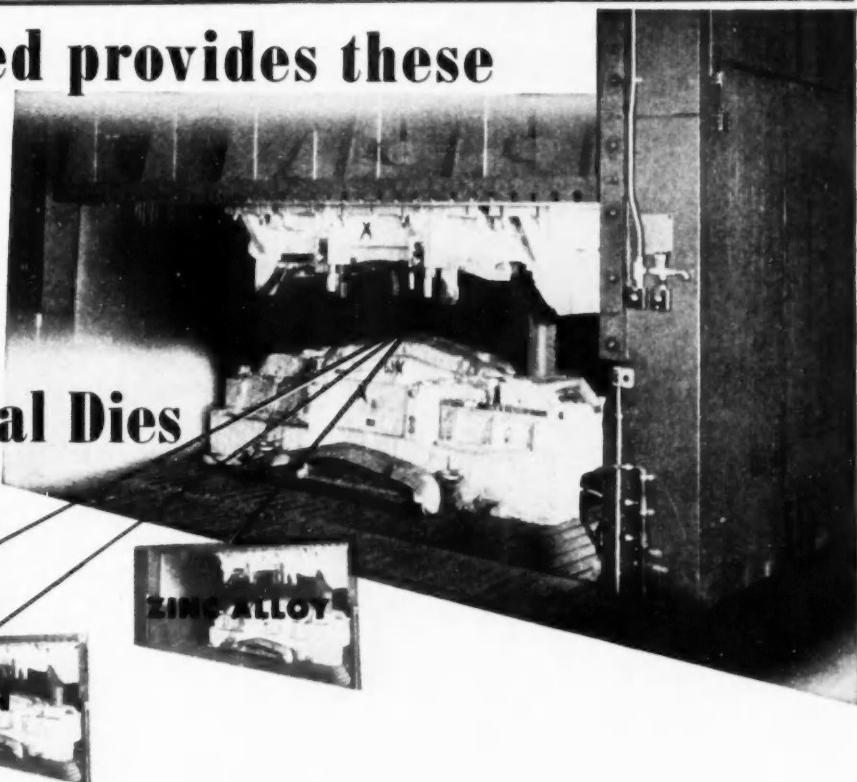
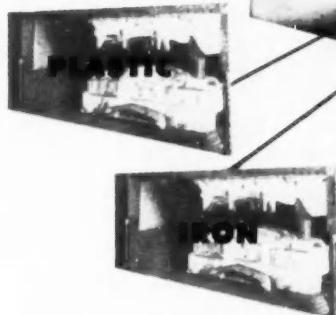


# Only Allied provides these

# 3

*types\* of*

## Sheet Metal Dies



**To Give You the Best Die...The Most Economical Die...for Your Production**

\*Combinations of materials are also used.

### Other Allied Products

**SPECIAL COLD FORGED PARTS • STANDARD CAP SCREWS • HARDENED AND PRECISION GROUND PARTS • R-B INTERCHANGEABLE PUNCHES AND DIES**

How can a *complete* sheet metal die service, such as Richard Brothers Division offers, result in substantial time and cost savings for you?

Suppose you have a few experimental parts to produce. Here a die made of Rezolin Tool Plastik may prove to be the answer. As this material does not shrink or expand, it permits fast, low-cost production of accurate dies. Where production runs exceed the limitations of plastic dies, yet still are not in very high volume, Allite zinc alloy dies can be used—again with savings of time and money by comparison with hard dies.

When the parts are required in high volume, the experience gained in the use of the plastic or zinc alloy dies is applied in the manufacture of the production dies. The true die conditions demonstrated in short-run production make possible a direct approach to building the long-run dies, with resulting savings in development, finishing and tryout.

Here at Richard Brothers Division—under one roof—you have a sheet metal die service that is unique—that can be put to work for you to cut your production costs. Why not investigate its possibilities ... today?



### ALLIED PRODUCTS CORPORATION

DEPT. D-13

12645 BURT ROAD

DETROIT 23, MICH.



PLANT 1  
Detroit, Mich.



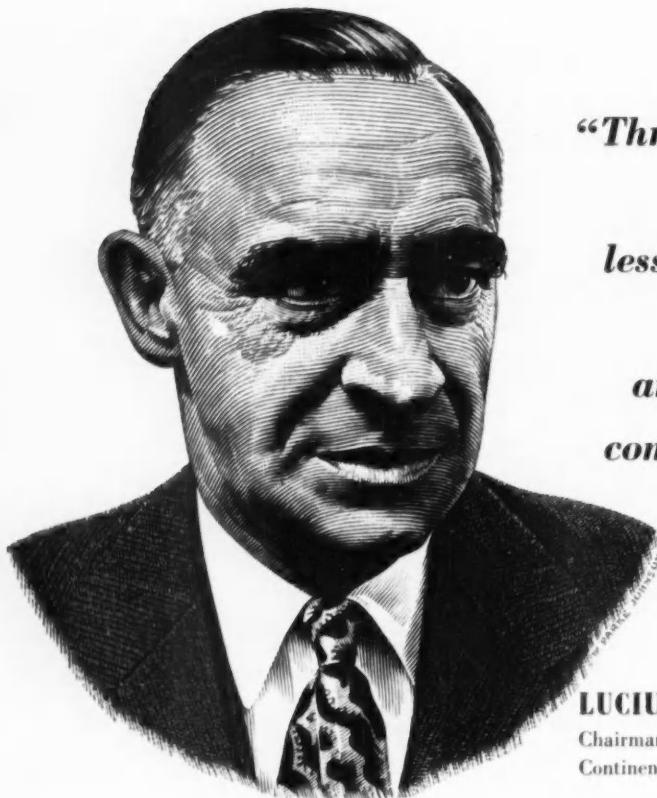
PLANT 2  
Detroit, Mich.



PLANT 3  
Hillsdale, Mich.



PLANT 4  
Hillsdale, Mich.



**"Thrifty citizens . . .  
with Savings Bonds . . .  
less likely to be taken in  
by the false promises  
and ideologies of  
communist propagandists . . ."**

**LUCIUS D. CLAY**

Chairman of the Board  
Continental Can Company

***"The regular purchase of Savings Bonds through the Payroll Savings Plan by millions of our citizens contributes importantly to the country's economic stability, the national defense effort, and to the financial independence of the individual. The thrifty, self-reliant citizen is one far less likely to be taken in by the false promises and ideologies which communist propagandists invariably direct to the 'have nots'."***

- To thousands of company executives, accountants, payroll department employees, PSP means Payroll Savings Plan, the simple payroll allotment operation through which employees make a monthly investment in U. S. Savings Bonds.
- To almost eight million employees of nearly 50,000 companies, PSP has a more intimate connotation. To them, PSP spells Personal Security Plan.
- Multiply the personal security of a single Payroll Saver by 43,000,000—the number of individuals who hold Savings Bonds having a cash value of \$49.5 billion—and you have economic stability that is the keystone of our national defense.
- Thanks to the thousands of companies which offer their employees the Payroll Savings Plan, Bill Brown in the Machine Shop . . . Joe Green in the boiler room . . . and eight million more Browns and Greens can well turn a

deaf ear to ". . . the false promises and ideologies . . ." of communist propagandists. Bill can see his new home taking shape in his growing stack of Savings Bonds . . . Joe sees each bond another step toward a college education for little Joe . . . and the "Old Timer," who eats his lunch with Bill, talks of "sitting down pretty soon" because his Bonds will make a nice addition to his Social Security.

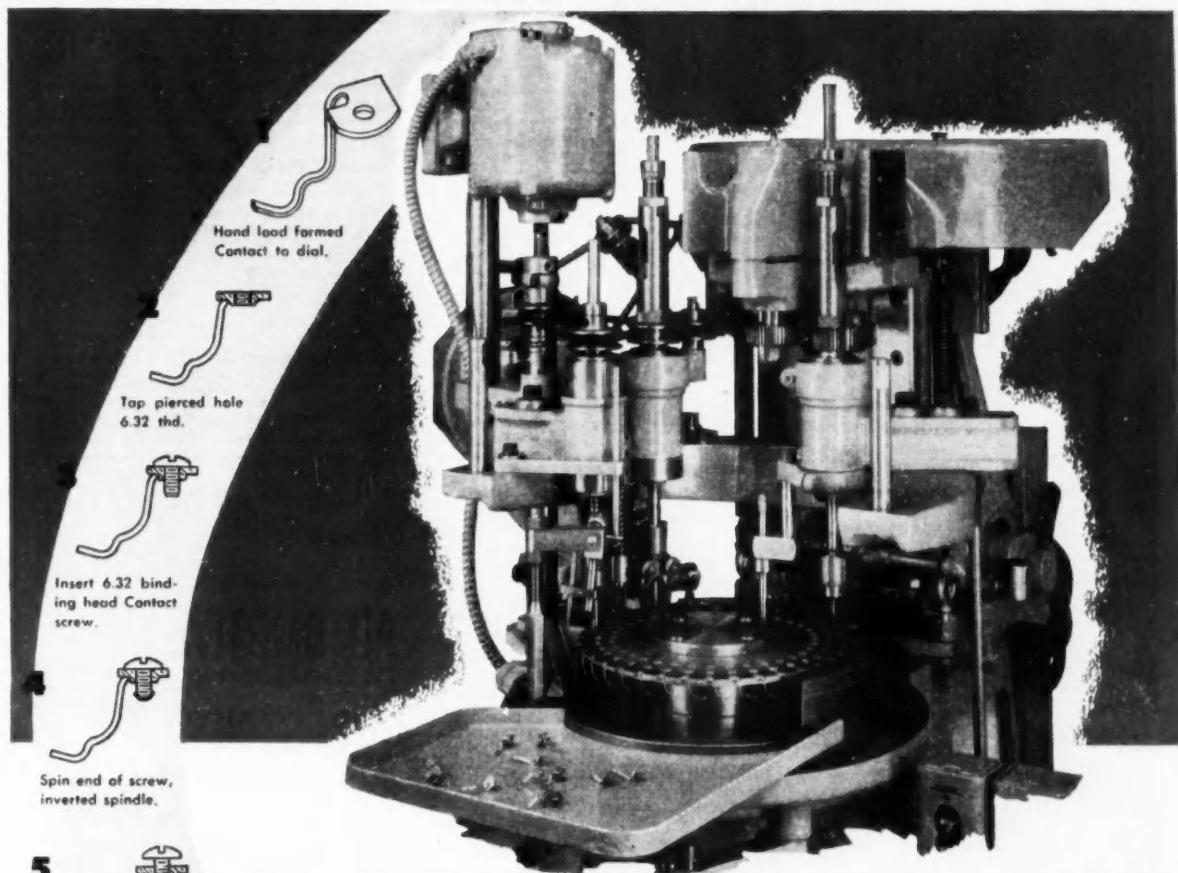
- PSP holds still another benefit—this one for the employer. Payroll Savers are conscientious workers. Statistics show that absenteeism goes down, production improves and accidents decrease as payroll participation goes up.
- If employee participation in your Payroll Savings Plan is less than 50%—or if your company does not have a Payroll Savings Plan—get in touch with Savings Bond Division, U. S. Treasury Department, Washington Building, Washington, D. C. Learn how easy it is to help your country, your employees and your company—through the PSP.

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**AUTOMOTIVE INDUSTRIES**



# Bodine CASE HISTORY NO. 35



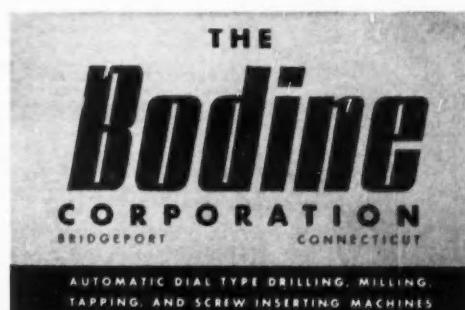
## PRODUCING FLUORESCENT TUBE SOCKET CONTACTS

Bodine No. 40-10 Dial Type Tapping and Screw Inserting machine (all safety guards removed) tooled for production of Fluorescent Tube Contacts. Production rate, 60 pieces per minute.

Bodine multiple spindle automatics lead the field in high speed repetitive production of small parts. If your needs involve drilling, tapping, milling, screw inserting, staking and assembly operations . . . there's a Bodine model we can tool to handle several or all of them on one machine. Ask us for case histories showing what we have done to cut costs of accurate quantity production.

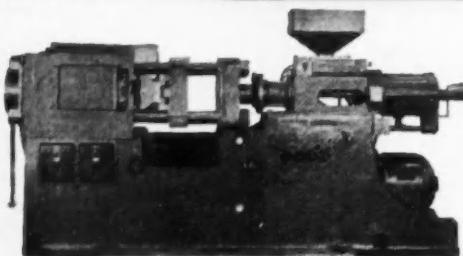
\* Ejection is accomplished by contact on the backed up screw, thus giving automatic inspection for perfect work.

"You Can't Meet Tomorrow's Competition  
With Yesterday's Machine Tools."



- ★ Quality
- ★ Beauty
- ★ Durability
- ★ Utility
- ★ Economy

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### SKEPTICS WANTED

... who think they can't better the Quality, Service and Price of their present Plastic Molding! (Specially equipped for short runs)... . Skeptics who think their product can't be adapted to or improved by Plastic Molding—and at lower cost! Our consulting Engineers are ready to UN-skepticalize you and show you how. Write, wire or phone today. Let's talk... there's no obligation.

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write for Catalog 146-G

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**RAILS** *New and Relaying!*

TRACK MATERIALS AND ACCESSORIES CARRIED IN STOCK

Switch Material • Spikes and Bolts • Track Tools • Ties • Tie Plates • Bumpers • Complete Side Tracks

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**PIPE and AUTOMOTIVE PLUGS and FITTINGS**



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## Automatic ENGINE CONTROLS

SYNCHRO-START PRODUCTS, INC.  
8151 N. RIDGEWAY AVE., SKOKIE, ILLINOIS

See our full page "ad" in the STATISTICAL ISSUE p. 399

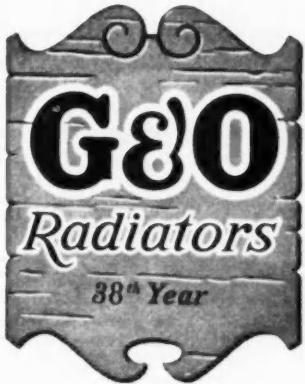
### Classified Advertisements

WANTED—PROJECT ENGINEER, ALSO Chief Draftsman. Both by established small company in engineering and metals field with equally divided industrial and long range research-development defense project. Location, fine small midwest home city with little industry. Require loyalty, mentality, vitality, stability, judgment: excellent opportunity. Write fully, including salary earned and expected, Box 70, Automotive Industries, 5601 Chestnut Street, Philadelphia 39, Pa.

WANTED—AUTOMOTIVE COPYWRITER. Opportunity for young man with successful automotive writing and sales promotion experience in growing fully recognized Ohio Agency with automotive, farm and general accounts. Write Box 71, stating experience and qualifications and send photograph.

AUTOMOTIVE  
INDUSTRIES  
Goes into  
Leading  
Plants in the  
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and Aircraft  
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ENGINE COOLING RADIATORS

- HEATERS

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**THE G&O MANUFACTURING CO.**  
NEW HAVEN CONNECTICUT

## SALES MANAGER WANTED

● Nationally known organization that manufactures plastic extrusions wants man to head sales department. He will be responsible for establishing sales policies and must be qualified to sell himself. Experience in selling plastic or rubber extrusions to electrical appliance or automotive industries is important.

Here is a job for a man of mature experience who wants to grow. Substantial salary now, with even larger return if performance so warrants. He can help build his own future.

Send complete resume, past experience, business connections and other information you believe will assist us in making our decision. Replies held in full confidence.

**BOX 69**

Automotive Industries

5601 Chestnut St., Philadelphia 39, Pa.

# SEE HOW *Hapman* TUBULAR CONVEYORS ARE ENGINEERED FOR LOWER HANDLING COSTS

Get your  
copy of  
this new  
Bulletin



To give you big, long-term savings in conveying bulk flowable materials, Hapman offers many exclusive conveyor engineering features.

Among them are long-lived Sealed-Pin Chain (patented), All-Round Neoprene Flights, Roller Turns for special conditions, and other superior mechanical advantages.

Learn more about them all—and you'll see how Hapman Tubular Conveyors get bulk handling costs down and keep them down!

**WRITE FOR NEW  
BULLETIN AI-753**

**HAPMAN**  
Conveyors handle:

METAL Chips, Sludges, Carbonum Dust — Wet or Dry CHEMICALS: Powdered, Granular, Abrasive, Corrosive — FOODS: Wet Spent Grains, Starch, Flour, Malt —Powered Coal, Ashes, Filter Cake, etc.

Below: Illustration from new bulletin shows conveyor discharging metal chips into tote box.



**Hapman CONVEYORS, INC.**  
DIVISION HAPMAN-DUTTON COMPANY  
KALAMAZOO MICHIGAN

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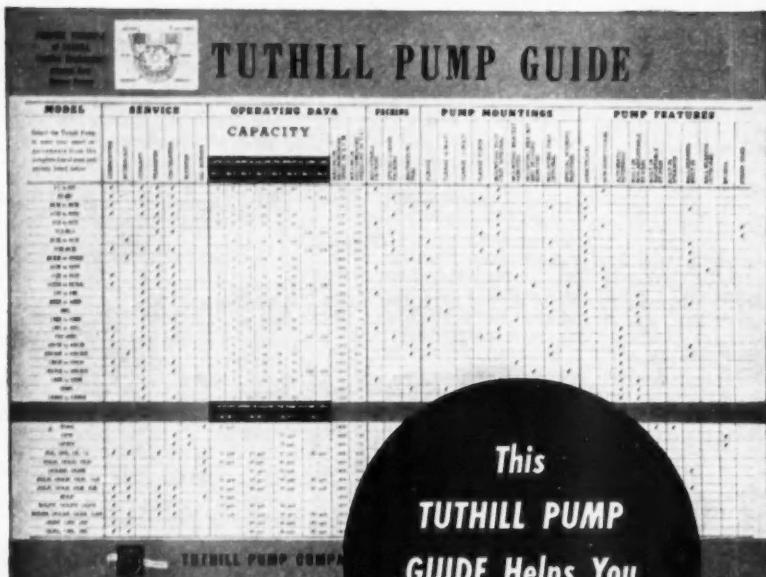
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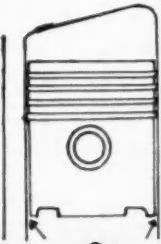


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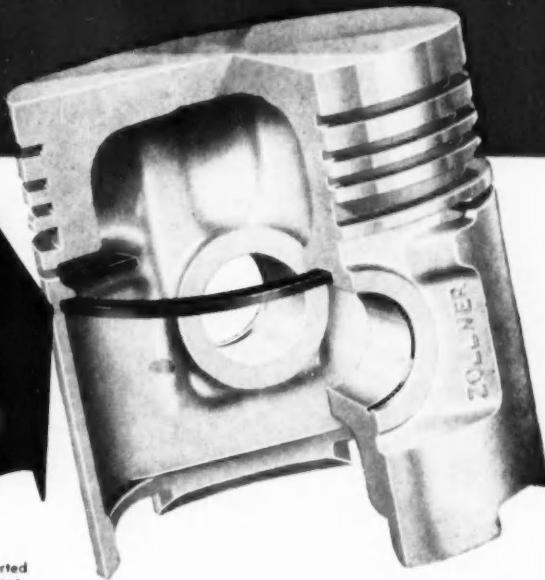
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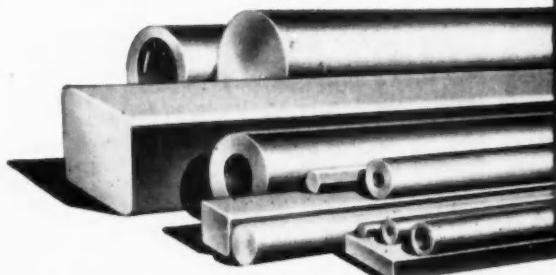
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